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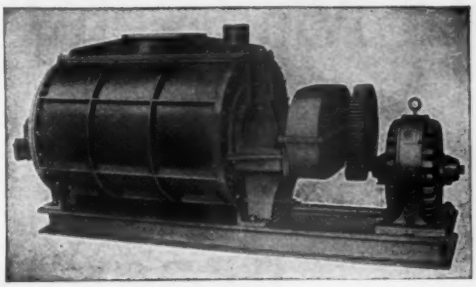

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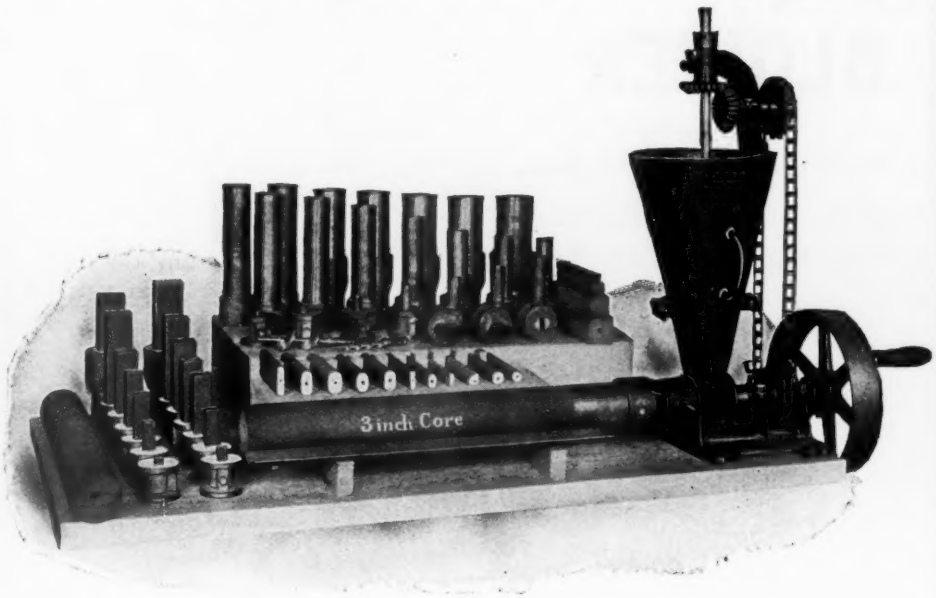

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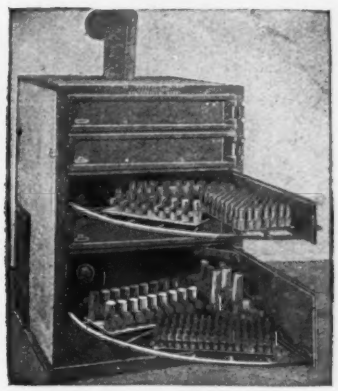

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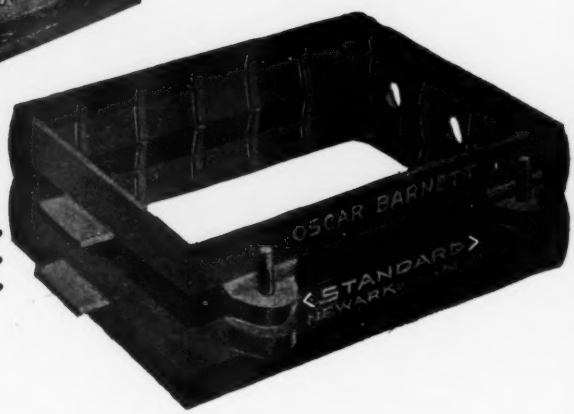

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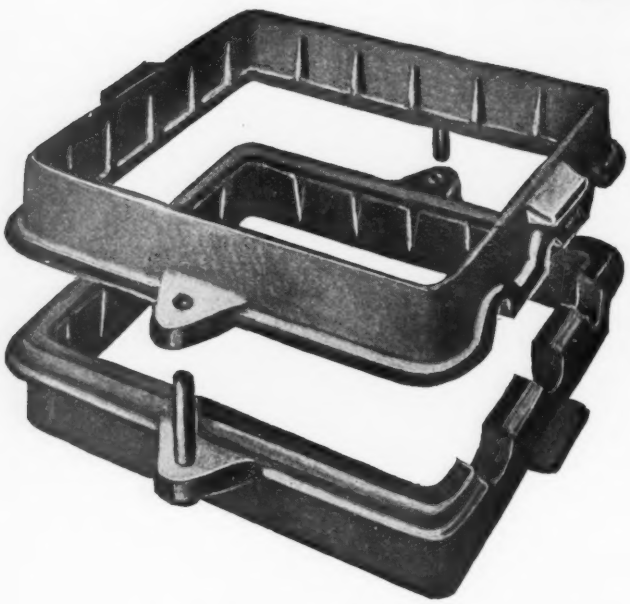

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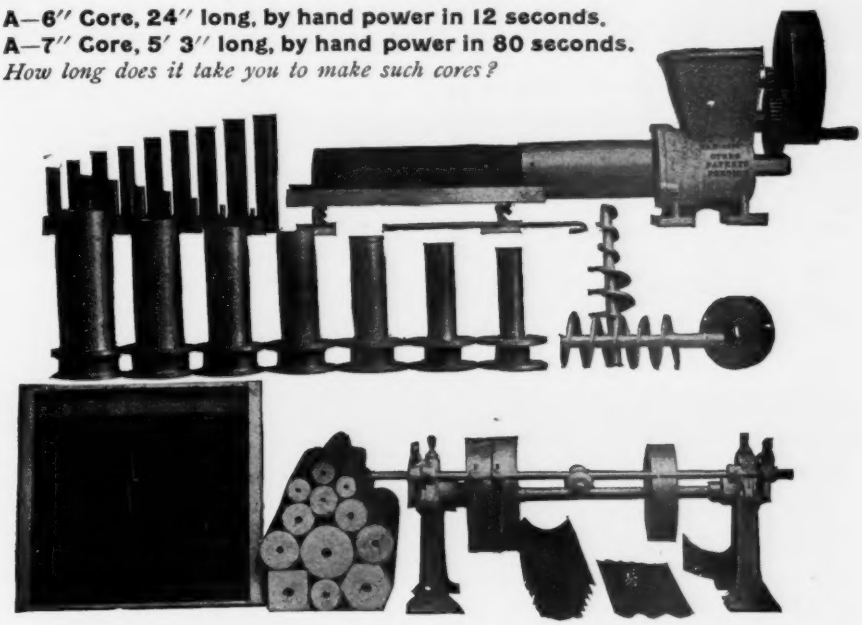

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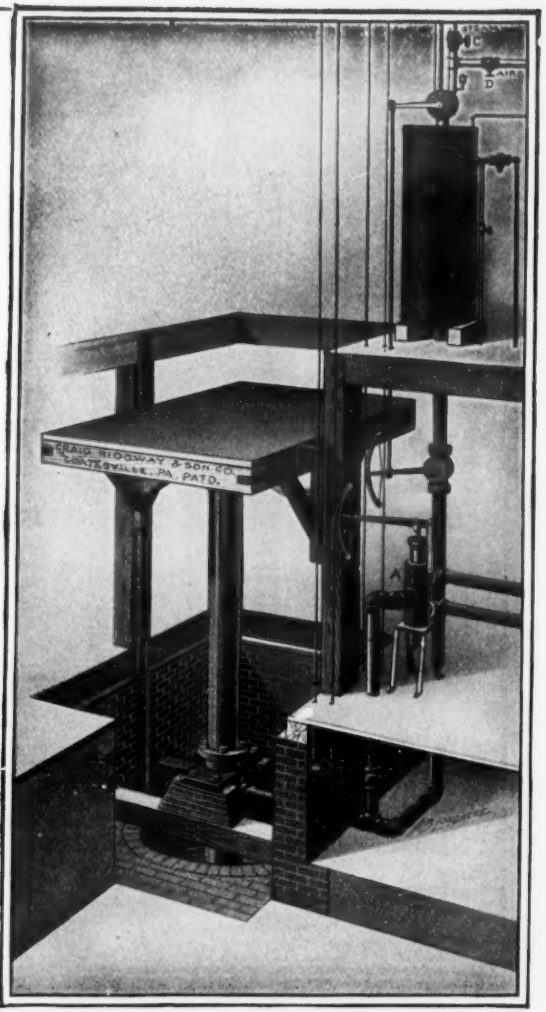


THE FOUNDRY

Vol. 30, No. 3 *CLEVELAND, OHIO, MAY, 1907.* *Whole No. 177*

A MODERN ACID OPEN HEARTH STEEL CASTING PLANT

New Department of the National Foundry Co., Erie, Pa.

A STEEL foundry for the production of acid open-hearth castings has been added to the gray iron plant of the National Foundry Co., Erie, Pa. Notwithstanding the tremendous annual consumption of iron and steel by the manufacturers of the Erie district, and the natural advantages of the city as an ore-receiving port, neither steel works nor blast furnaces have yet been located within its confines, and the pouring of the first heat on March 4 was an event of considerable local interest, as it marked the initial production of steel in this important foundry center. Additional interest is also attached to this venture, as it reflects a growing recognition among gray iron founders of the rapid replacement of iron sections with steel and their inclination to equip to meet the changing requirements of the trade.

FIG. 1—OPEN-HEARTH FURNACE

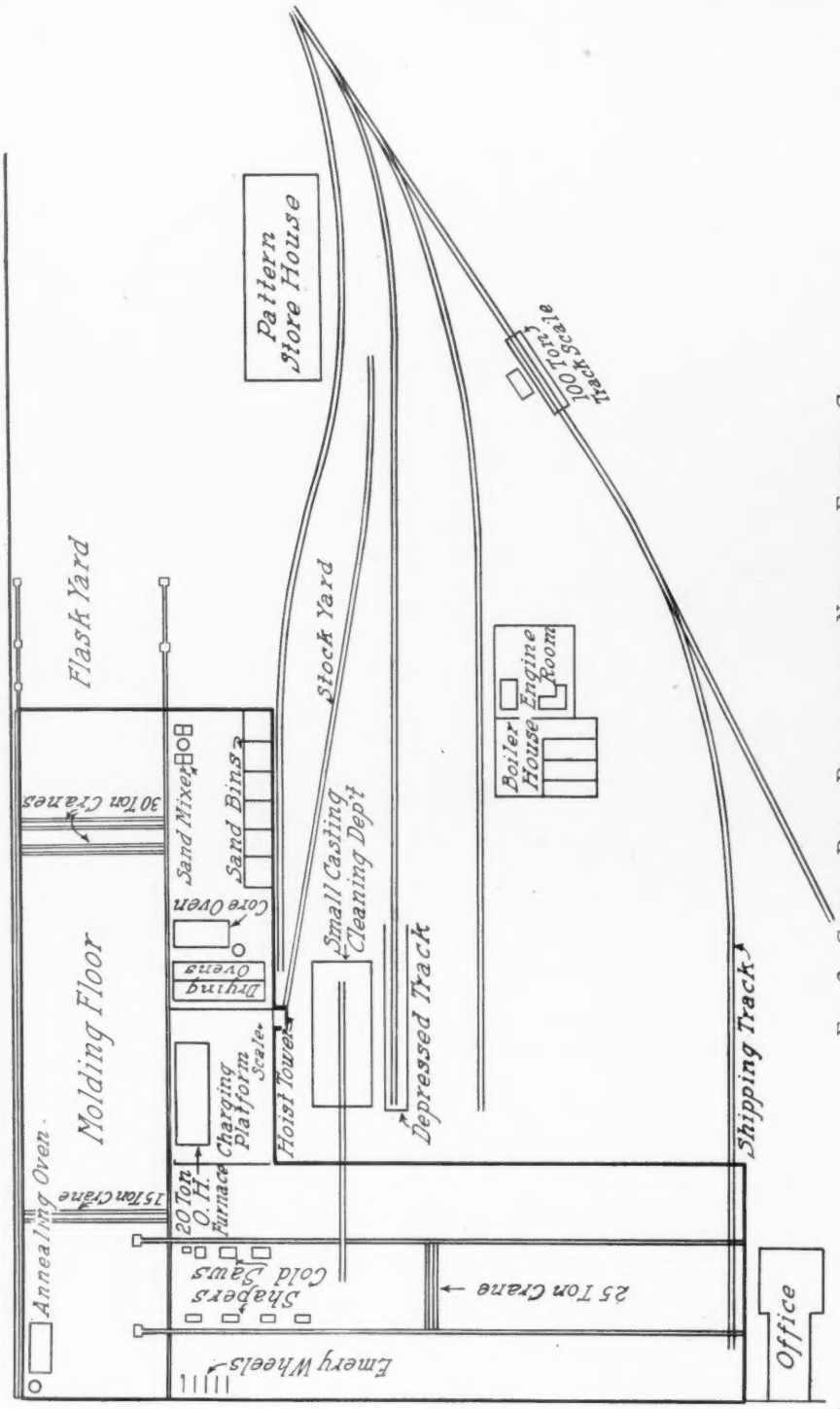


FIG. 2—GROUND PLAN, PLANT OF THE NATIONAL FOUNDRY CO.

In designing the plant, the utilization of existing buildings was not even considered, as it was manifest that structures intended for gray iron work are wholly unsuited for steel practice. A new building was planned with facilities for handling all kinds of jobbing work, from the smallest section to castings weighing 50,000 pounds. Head room, ventilation and lighting were carefully considered in the erection of the buildings, which were designed by F. Felkel, architect, Pittsburg, and which enters one end of the old building. The arrangement of the crane runways is clearly shown in Fig. 3.

Construction of the Building.

The building, which is of steel construction sheathed with puddled charcoal iron sheets, is divided into two bays under one roof. This type of construction is somewhat unique but was adopted with a view of eliminating one row of columns and provides an unbroken molding floor. The building is 331 feet long and 122 feet 6 inches

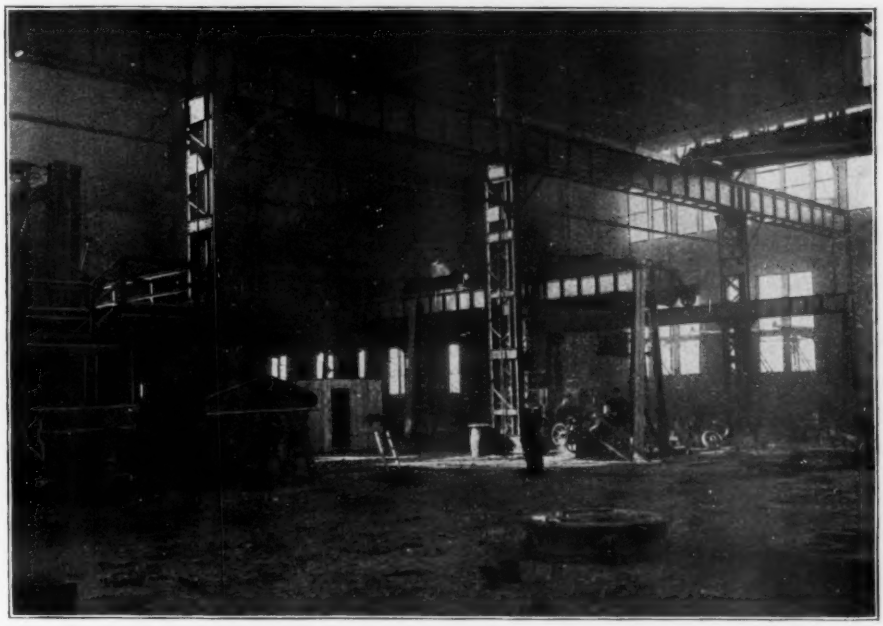


FIG. 3—ARRANGEMENT OF THE CRANE RUNWAYS

ample space provided for the erection of additional furnaces, if required.

Plant Arrangement.

The steel foundry, a general view of which is shown in Fig. 4, is built at right angles to the gray iron plant with which it connects at one end, as indicated in the ground plan, Fig. 2. The crane runway from the gray iron department extends into the steel foundry a distance of 15 feet under the main runway to facilitate the transfer of castings to the cleaning department and their final disposition through the gray iron plant to the shipping track wide. The height to the center of the crane rail is 32 feet 6 inches, with a clearance of 8 feet, to the under side of the roof truss, while the extreme height to the peak is 80 feet. The height to the top of the crane rail was decided upon to allow ample clearance for the handling of large castings and for the future installation of an overhead charging machine to serve the open-hearth furnaces.

In designing the building the problem of making the roof trusses over the two bays symmetrical was solved by making the width of the ventilators

27 feet 6 inches, the difference in the width of the two spans, which are 75 feet and 47 feet 6 inches respectively. Owing to the width of the bays between columns, the use of longitudinal girders supporting the additional roof trusses was obviated by the adoption of a special system of purline girders supporting intermediate rafters, which carry the balance of the purlines. Members in the plane of the lower chord were necessarily of extreme length, and are supported at intermediate points, both vertically and horizontally.

Two rows of windows extend the length of the building on either side and are somewhat more than the usual height above the ground. This arrangement was adopted as the foundry extends to the north line of the property, where it adjoins another plant, and to avoid the possibility of shutting off the light by future construction on this side, the windows were placed well above the ground level. The natural illumination, even on the darkest days, is ample, and for night work 14 Cooper-Hewitt mercury vapor lights have been provided, which are located at a height of 40 feet above the floor and give a well-diffused light, eliminating all shadows.

The ventilators in the gable extend the length of both sides of the building and are operated from the foundry floor. The building is constructed to withstand the severest shocks, approximately 700 tons of steel having been used in its erection.

Molding Floor.

The main bay is used entirely as the molding floor and is commanded by three electric traveling cranes having a span of 71 feet 8 inches, which were installed by the Morgan Engineering Co., Alliance, O. Two are of 30-ton capacity each and are equipped with 5-ton auxiliary hoists, while the third has a capacity of 15 tons. The latter, which can be operated at a high speed, is used almost entirely for transferring castings to the cleaning floor and also serves the annealing room, while the heavier cranes handle the ladles, flasks, molds, etc. In the smaller bay are located the open-hearth furnace, core

FIG. 4.—GENERAL VIEW OF THE MOLDING FLOOR

and drying ovens, sand bins, mixer and core department.

The stock yard is located between two standard gage tracks paralleling the furnace side of the plant. All of the incoming material in the form of sand, iron and scrap is unloaded from the track adjacent to the building and the other track, which can also serve the yard, is primarily used for the shipment of small castings and is conveniently located for the loading of cars from the small casting cleaning department. A narrow gage track extends through the stock yard on which the charging buggies operate and leads to the hoist tower which contains a 5-ton Otis elevator for raising the pig iron and scrap to the charging floor.

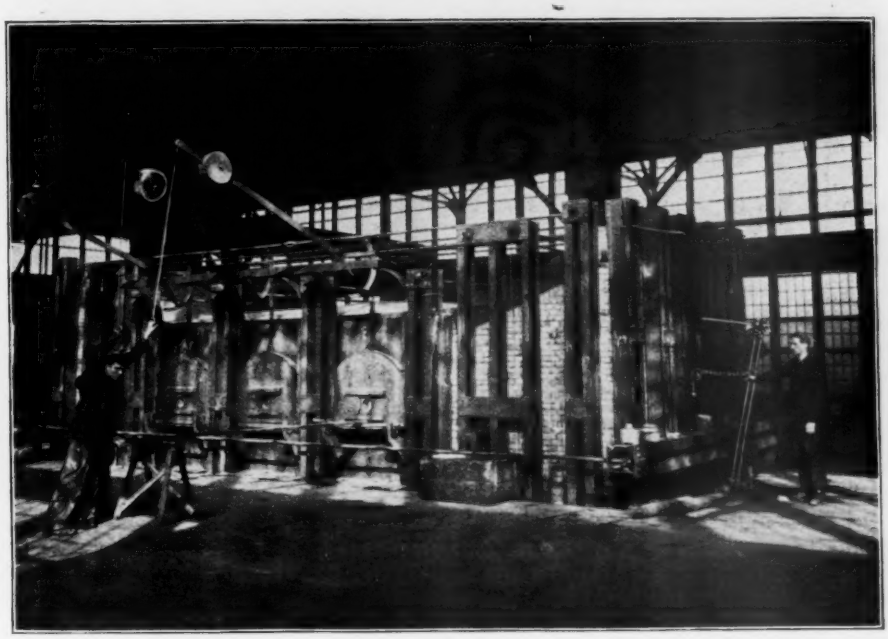


FIG. 5.—OPEN-HEARTH FURNACE CHARGING FLOOR

Open-Hearth Furnace.

The open-hearth furnace, Fig. 1, is of the acid type, has a rated capacity of 20 tons, and was installed by Alex. Laughlin & Co., Pittsburg. The furnace foundation is concrete and as the masonry extends only 5 feet 8 inches below the floor, the furnace has been raised well above the ground level, which permits the filling of the ladles suspended from the cranes, and does away with ladle pits entirely. Oil is used for fuel, the Kirkwood system having been installed by Tate, Jones & Co., Pittsburg. Burners are located at either end of the furnace and are operated singly, the valves being reversed every fifteen minutes. The burners when not in use are withdrawn as shown in Fig. 5, the air and oil pipes being hinged to permit the withdrawal of the burners when not in use. The furnace has also been built for the use of producer gas if a change to coal becomes necessary. The charging platform, Fig. 5, is supported on heavy structural steel members and is provided with steel plate flooring. It is 64 x 46 feet in dimensions, and is raised to a height of 12 feet 6 inches above the foundry level.

Melting stock is delivered to the charging floor on flat cars which are loaded in the stock yard, and after being weighed on a scale opposite the elevator opening, are moved in front of the charging door where the material is unloaded by hand. To facilitate the handling of pig metal and

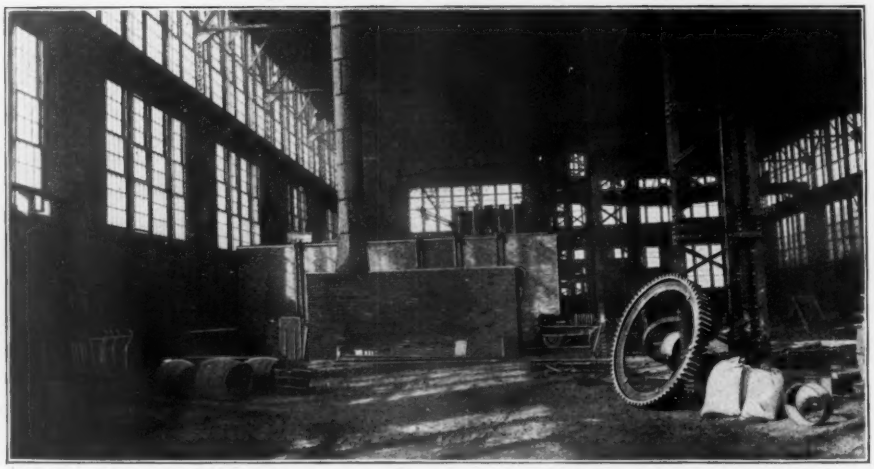


FIG. 6.—CORE AND DRYING OVENS

large pieces of scrap a long bar resting on rollers is used, which, after being run into the furnace is given a slight twist and the burden is dropped. To secure a uniform distribution of stock three charging doors, each three feet wide, have been provided. The furnace spout extends into the main bay, where the steel is tapped into 20-ton bottom pour ladles, manufactured by the W. B. Pollock Co., Youngstown. By varying the size of the nozzles, either a light or heavy flow of metal can be had, thus adapting a large capacity ladle to the pouring of either small or large molds. Provision has been made for the installation of an overhead charging machine and one will be added when the second furnace is built. The narrow gage track from the stock yard likewise extends into the foundry underneath the charging platform, a turntable being provided on the elevator. This facilitates the movement of material into the plant from the yard.

Drying Ovens.

Two ovens for drying molds are located in the smaller bay near the open-hearth furnace. They are each 45 feet

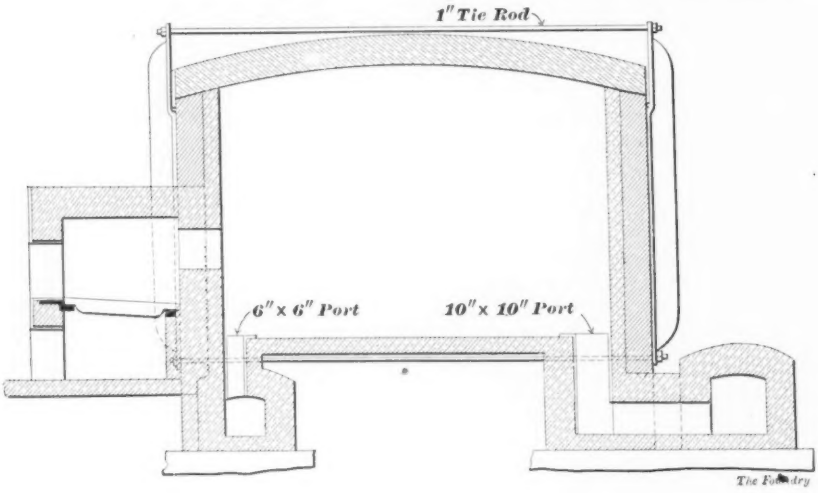


FIG. 7.—CROSS SECTION ANNEALING FURNACE

long, 10 feet wide and 12 feet high, built of brick with rails in the roof having brick arches sprung between them. A standard gage track extends into each oven from the main bay, where the molds are placed on flat cars by means of cranes. Each oven has a capacity of five cars, which are operated by a cable haulage system. The ovens are fired from the floor level at two points to secure a well diffused heat and the ashes are removed from a pit underneath. The core oven adjoins the annealing ovens, is built of brick and is 25 feet long, 10 feet wide and 7 feet 6 inches high. It contains one standard gage track on which the core buggies operate and is fired from the rear at only one point. One flue serves the three ovens, as indicated in Fig. 6. The core department is located between the sand bins and the drying ovens.

The sand bins, six in number, are divided by wooden partitions and have a capacity of two cars each. The sand is unloaded from cars on the inbound track which parallels this side of the building. The mixer is located in the smaller bay convenient to the sand bins and core department, as shown in the ground plan, Fig. 2.

Sequence of Operations.

The foundry has been planned for a logical sequence of operations. After the molds are made they are taken to the drying ovens, if the sections are not to be cast in green sand, and after being removed are conveniently placed in the foundry for casting. After being shaken out they are conveyed by the cranes to the cleaning department, and if necessary, to the annealing ovens located in this section of the main bay. The shapers, cold saws, etc., which are operated by individual motors, have been placed underneath the 25-ton crane runway from the gray iron foundry, as shown in Fig. 3. This has a span of 40 feet and commands the center aisle of this department, which has a width of 110 feet. It provides only limited head room, having a height of only 16 feet to the top of the crane

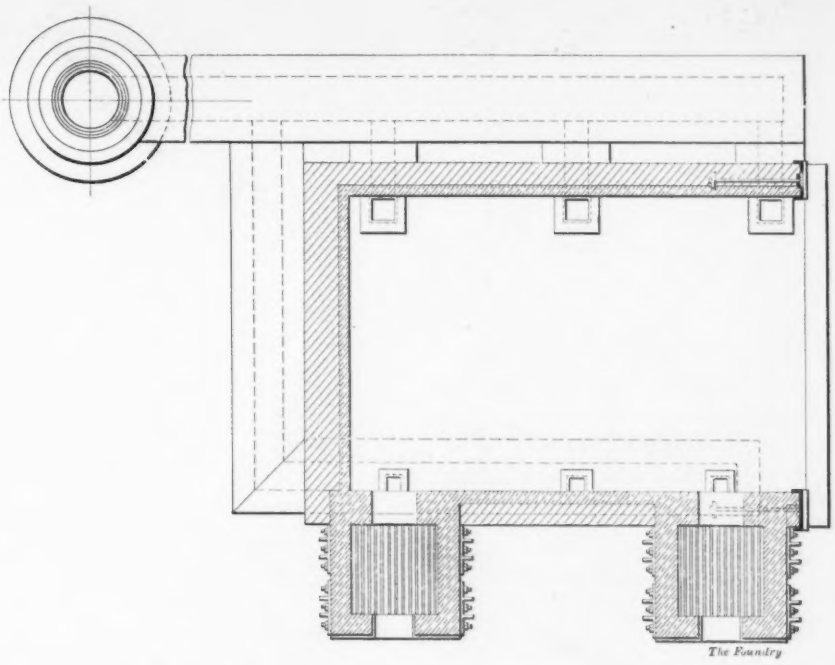


FIG. 8—PLAN OF THE ANNEALING FURNACE

FIG. 9.—END VIEW OF STEEL FOUNDRY SHOWING SLIDING AND LIFTING DOORS FOR PASSAGE OF CRANES

rail and is 15 feet below the main runway in the steel foundry. Swinging grinders are arranged in a row at one end of the plant and are driven by belts from a common shaft operated by a motor. The finishing department for cleaning small castings is located in a separate building, Fig. 2, and is 80 x 30 feet.

Annealing Furnace.

The annealing furnace, shown in Figs. 7 and 8, is 20 feet long, 10 feet wide and 7 feet high and is fired from two points at the side, as shown in the plan view. It contains three ports 6 inches square on the firing side, and the same number, 10 inches square, on the opposite side. By this arrangement the heat is evenly diffused, making one side of the oven as hot as the other. The ovens were designed by W. A. Riddell, superintendent of the plant.

FIG. 10.—CROSS SECTION AND END ELEVATION OF STEEL FOUNDRY

Lifting and Sliding Doors.

The main crane runway extends through the large bay into the flask yard, a distance of 64 feet, as shown in Fig. 9. This arrangement permits the handling of heavy flasks by cranes. Lifting and sliding doors have been provided for the passage of the cranes into the yard which are decidedly novel in construction. The large center door shown in Fig. 10, provided for the passage of the crane load is 28 feet 9 inches high and 16 feet wide, and is mounted on roller bearing wheels which operate on a narrow gage track. Its trussed steel frame is covered with sheets to conform with the sheathing of the remainder of the building. The lifting door provided for the passage of the crane bridge is 74 feet long, 9 feet 6 inches high, and when closed rests on the crane runway on either side. The door is elevated by wire cables, attached at two points, which pass over two sets of 20-inch sheaves, and is counter-weighted slightly less than its own weight. To the bottoms of the counterweights is attached an equalizing bar with a cable fastened to its center, which passes down to a winch on the floor. This arrangement permits one man to raise the door. To increase the lighting at this end of the plant the door has been covered with a translucent fabric.

Power House.

The power house is 50 x 76 feet 4 inches, of concrete block construction, and has an iron roof. It is equipped with three 150-horsepower boilers and a 300-horsepower 4-valve engine furnished by the Erie City Iron Works. The engine is direct connected to a 200-kilowatt generator made by the Burke Electric Co., Erie. A compound air compressor, having a capacity of 830 cubic feet per minute, was furnished by the Bury Compressor Co., Erie. Oil pumps for the Kirkwood system are also located in the engine room and sunken oil tanks with a capacity of 20,000 gallons are conveniently located and are filled from cars by gravity. The pattern shop and pattern storage is 36 x 100 feet, and coke and sand sheds have also recently been added. The company will continue the manufacture of gray iron castings melting about 40 tons per day, and will later use for this purpose the old plant on Cascade street, which it owns, and which is temporarily occupied by the Cascade Foundry Co.

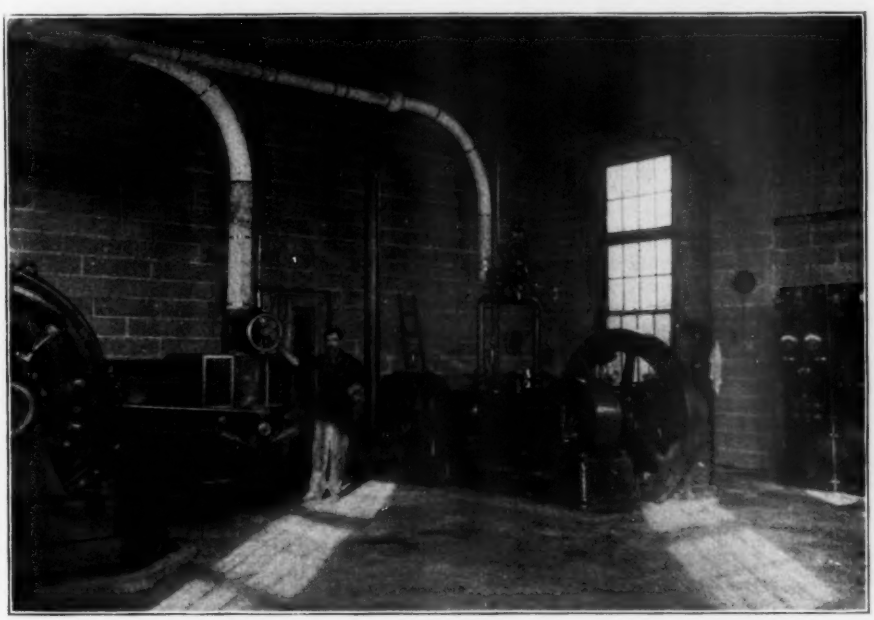


FIG. 11.—ENGINE ROOM, POWER PLANT NATIONAL FOUNDRY CO.

MANUFACTURE OF MALLEABLE IRON*

Discovery of the Process—Charging and Melting—Construction of Furnaces

Physical Properties and Suggestions for Inspection

By G. A. Akerlind

WHEN speaking of malleable iron, we understand by that term, an iron casting made malleable by a process of annealing. In some branches of engineering, we rarely meet with this interesting product of metallurgy, while in other branches, for example, freight car building, the construction of conveying machinery and agricultural implements, malleable iron is one of the most important materials the engineer has to deal with and an intimate knowledge of the physical properties and peculiarities of this metal is therefore highly desirable.

I do not wish to be understood to say by this statement that engineers in general lack knowledge on this subject, but as far as I have been able to observe, I think a good many of us would be benefited by a review of the subject of malleable cast iron, its manufacture, its physical properties and its treatment in the hands of the designing engineer.

False Definition.

In a modern technical reference book, I find this definition of malleable cast iron:

"Malleable cast iron is the name given to castings made of ordinary cast iron which have been subjected to a process of decarbonization, which results in the production of a crude, wrought iron. The castings are made in the usual way and are then embedded in oxide of iron, etc." Furthermore it is stated: "It only requires proper mixtures and proper annealing, coupled with care in other particulars, to make malleable castings that will weld; that will draw out to a knife edge on an anvil under a hammer and that will temper and cut soft iron like a cold chisel."

This I think is too good to be true and I have not found any authorities on malleable castings, few as they are, to be as enthusiastic as that.

If an engineer with the ability and reputation of the author referred to, has such vague ideas about malleable cast iron, it is certainly not to be wondered at that the average engineer has an equally vague knowledge of the subject.

Cast iron as extracted from the ore, is the base for the production of iron and steel. We are accustomed to regard all substances accompanying iron as "impurities" but let us remember that chemically pure iron only exists as a curiosity of the laboratory; a substance without any value for structural purposes. Cast iron as a practical metal contains generally carbon, silicon, sulphur, phosphorus and manganese and the various proportions of these ingredients together with the remarkable phenomena in regard to combined and graphitic carbon form all the varieties of cast iron, malleable iron, wrought iron, mild steel and tool steel.

There is even a more apparent difference between the gray iron center and the white iron rim in a cast freight car wheel than there is between the two distinct metals lead and tin, and this great difference is not brought about by any mixing of the metal after it leaves the cupola, but simply by utilizing the well known phenomena that a sudden cooling of the molten

*Read before the Scandinavian Technical Society, Chicago.

iron will cause a chemical combination between the iron and the carbon it previously contained in the form of graphite. To this phenomenon is due the enormous production of chilled cast iron wheels for freight cars, and it is again this very phenomenon which forms the basis for the manufacture of malleable cast iron which, particularly in this country, has reached such enormous proportions and made possible the production of machines and implements at such low cost which would be impossible without it.

Discovery of the Process.

In 1722 Reamur published the fundamental principles for the malleable process, but it is only in recent years that the industrial world has utilized this knowledge.

It was found that if a casting too hard to work were exposed to a continuous high heat for a number of days, imbedded in rolling mill scale (hammer slag), or iron ore, the casting would entirely change its nature, and at the time stated Reamur had collected those observations and found the principles which governed this change in the cast iron. The generally accepted theory of the malleable cast iron process is to decarburize the metal by some oxide, which will impart a portion of its oxygen to the carbon in the metal at a red heat, forming carbonic oxide, which is given off, thus extracting the carbon. The oxidizing reagents usually employed are rolling mill scale and red hematite iron ore.

Annealing.

It is important that this material should be as free as possible from sulphur, which is the most objectionable element in malleable iron. The theory as expressed above does not, however, seem to cover the field, as malleable castings are now produced without any decarburizing material, the hard iron castings being packed in fire clay or sand instead of rolling mill scale or hematite ore. For small castings this treatment gives fairly good results, but for heavier castings tests and analyses show an inferior product.

It has already been stated that a malleable cast iron is produced from hard or white castings and the means by which this important property is secured will next be considered.

Malleable Furnace.

The furnace most commonly used in malleable foundries is of the reverberatory type as it has the great advantage of melting the charge without the fuel coming in contact with the metal. These furnaces vary greatly in details of construction.

The ash pit is enclosed and contains the air inlet from the blower. The grates are charged with good bituminous coal through side doors which are hermatically closed except at the time of charging. The flame passes the bridge and in some furnaces an additional supply of fresh air is forced through a number of small pipes in the direction which the gases travel. The hearth is slightly inclined toward the bath where the molten metal collects and on this hearth is carefully piled the charge to be melted.

The roof immediately over the hearth is composed of a number of built-up arches which are handled by a small traveling crane over the furnace. In charging the furnace these arches are removed and when again placed in position all cracks or joints are closed with fire clay. A little above the high level of the bath are small rectangular openings on each side of the furnace. Through these the changes inside the furnace are observed and wrought iron bars are inserted for skimming off the slag and for rabbling or puddling the molten metal until the desired quality is reached. Beyond the bath is the choke; and finally the smoke stack about 75 to 100 feet high.

Charge.

At the bottom of the bath on each side of the furnace are located the tapping holes closed by clay plugs as in a cupola. The furnace is charged with pig iron, wrought iron, scrap, or old steel rails in such proportions as is deemed desirable for the castings to be made.

The pigs and rails are placed in layers somewhat diagonally so as to permit the flames to circulate freely through the mass on their way over the bath to the smoke stack. After the charge is placed in the furnace, the bungs, or sectional arches, are placed in position, all openings closed and the fire started. Five to 10 tons is usually the charge according to the size of the furnace.

Melting.

During the process of melting, which requires three to four hours, the grate surface is kept even to prevent cold air from entering the furnace, and when the charge commences to melt, such parts as show a tendency to bake together are separated and led toward the bath where the slag formed is skimmed off so as to present a clean surface of the bath to the flame in order to get the full benefit of the heat. After the charge is melted, the bath is vigorously rabbled or boiled to insure a thorough mixture and to reduce the percentage of silicon to the desired point. This point is determined by dipping out a sample which is rapidly poured into a cast iron mold, quickly cooled and broken. If the fracture indicates the presence of graphitic carbon the rabbling is continued until a sample is procured whose fracture shows the desired composition or state of the metal.

The molders carry the metal with hand ladles to flasks nearby, for not only does the metal cool very rapidly, but chemical changes take place in the bath and everything must be done quickly. The tapping goes on from both sides of the furnace at the same time, and within about 30 minutes the whole charge is emptied and the furnace is allowed to cool to receive a new charge.

The castings are then removed from the flasks, the sprews and vents are knocked off and all cores cleaned out. The metal is now almost as brittle as glass and some care has to be exercised in its transportation to the annealing house.

Packing the Annealing Boxes.

The castings of similar weight and section are grouped and carefully packed in cast iron boxes varying in size to suit the articles to be annealed. The first of these boxes is placed on a cast iron plate resting on two blocks in such a manner that the prongs of the charging machine can enter underneath. The pieces to be annealed are then placed so that they may be completely surrounded by the packing material, and care is taken that some parts of the castings project over the edges of the box, thus forming a guide for the next section.

A pile about five feet high is formed in this manner and when completed, removed by the charging carriage to the annealing furnace, where the piles are placed in rows to allow the flames from the fire grate free play. The opening of the annealing chamber is finally bricked up tight and the fire started.

Annealing Furnaces.

These annealing furnaces are arched chambers about 7 feet high, 12 feet deep and 8 feet wide, with channels in the sides and under the floor arranged to convey the flames and the hot gases evenly through the rows of piles, and thus produce an even temperature.

Natural draft is used and the firing carefully moderated during the whole period of annealing from two to six days or more depending on the character of the castings.

The temperature is brought up to a bright cherry red or about 1,800 degrees Fahr. The furnace is provided with sight holes for observation, and the blue flames at the joints of the boxes give an indication of the process going on inside where the combined carbon leaves the iron to combine with the oxygen, which in turn, released from its combination with the iron in the ore or scale, forms a new combination as carbonic oxide or dioxide.

Cleaning the Castings.

After the furnace has cooled sufficiently the temporary brick wall in the

opening is removed and the boxes are taken out by the charging carriage and placed on the floor where the annealed castings are taken out and placed in the rattlers for cleaning. If the castings are small and of delicate nature they are cleaned by being placed in wooden vats containing a weak solution of sulphuric acid and pickled. To neutralize the acid after the pickling process, these castings are washed in lime water.

After the annealed castings leave the rattlers they are carefully examined for cracks or other defects and if sprung they are hammered or forced by hydraulic power to the correct shape. For such parts as are produced in great quantities, for example like brake heads for railroad cars, steel dies are made and placed in a drop hammer. The annealed casting is then placed on the die and one or two blows will return it to its correct form.

It should be stated that nothing is gained by heating a malleable casting before hammering or forcing it. A temperature of 50 to 100 degrees Fahr. seems to be sufficient.

Physical Properties.

The tensile strength of malleable cast iron varies between 40,000 and 50,000 pounds to the square inch, with an elongation in 6 inches of about 6 per cent to 10 per cent and a reduction of area about 3 per cent to ¾ per cent, respectively. This of course, for a specially prepared test piece with symmetrical form. Cast iron has a tensile strength of about 20,000 to 30,000 pounds to the square inch and is therefore about half as strong as malleable cast iron. For compressive strength cast iron is the stronger of the two and compares favorably with steel. The position of a casting in a machine is often such that the definite stresses are very difficult, not to say, impossible to determine and the engineer is left to his own judgment based on experience. If weight is the only object for using malleable sections in place of ordinary gray iron, it is customary, in railroad car construction, to make a reduction in weight of 30 to 40 per cent, sometimes more. The introduction of malleable cast iron in railroad cars some 15 years ago, was made more for the purpose of reducing the dead weight of the car than owing to the lesser strength of cast iron. The reason malleable cast iron is used to such a large extent in car construction today is not only due to the constantly increasing demand for a reduction of the dead weight but to the rapid supplanting of wood by steel and the consequent substitution of rivets for bolts, as well.

The ductility of malleable castings permits the driving of rivets which cannot so readily be done with gray cast iron, and for certain parts of the cars like the oil box in the benches, malleable cast iron is supreme, leaving cast iron and semi-steel far behind.

Shrinkage.

While malleable iron has a greater shrinkage than gray iron and as the sections of malleable castings invariably are lighter than similar casting of gray iron, fractures are very common, and it is therefore one of the first considerations of the designer to arrange and distribute the metal to meet these conditions. In pieces of an elongated shape, the stiffening ribs ought to extend lengthways so as to produce as little resistance as possible to the contraction of the metal at the time of solidification in the flask. If this is not possible, the molder provides a crush core with the exterior surface made of core sand, but whose interior is filled with crushed coke. This coke barely stands handling and when the metal solidifies in the flask is crushed by the retarding casting and thus prevents shrinkage cracks. At other times a certain corner or junction of ribs in the casting will be found cracked. To prevent this a small piece of cast iron is imbedded in the sand at this critical point and the metal will cool here more quickly than elsewhere and thus forti-

fy this particular point. It may happen that some other part of the casting will be found fractured instead, and in many cases the locations and the shape of strengthening ribs in the casting have to be altered until a casting is procured free from shrinkage cracks. Sometimes such defects do not appear until the casting is annealed which of course, entails a greater loss than if the casting had been scrapped before entering the annealing furnace.

Metal Thickness.

To make malleable sections successfully keep the metal in the different parts of the casting at a uniform thickness depending on its size and weight. If a small casting, about 10 pounds in weight, ¼ inch metal is about the practical thickness. For castings from 15 to 20 pounds, 5-16 and ⅜ inch to 7-16 inch, or ½ inch, for castings of 40 pounds and over. This applies to freight car casting. For commercial reasons the demand for light malleable castings sometimes forces the designer to give such dimensions for the thickness of the metal in his casting that the foundry cannot make it successfully, or else the manufacturer will insist on a price per pound that will protect him for the extra expense in making it and the loss due to a high percentage of cracked castings. These losses sometimes amount to 10 and as high as 20 per cent. It is a better policy to modify the design to suit the foundry, although on the other hand these same commercial interests on your side have to be guarded as those prompting the foundryman to insist on a heavy easily made casting.

Endeavor to avoid sharp junctions of ribs or other parts, and if the casting is long, say 24 feet or more, bear in mind that the ends should be of such a shape as will offer as little resistance as possible to the contraction of metal when cooling in the mold.

Inspection.

If called upon to inspect malleable castings for strength it is customary to break them with a sledge or under a drop and the number of blows and the appearance of the fracture determines the quality. A good casting will be found a pretty tough proposition to break. A fracture will show a distinct skin like wrought iron while the interior is finely granulated, of a dark bluish color, without metallic lustre. A bad casting breaks comparatively easy, does not show the skin, and may have a dark gray cast iron fracture. This is generally attributed to poor annealing, but as previously pointed out, if the metal does not have the right composition, the casting cannot be annealed. To guard against this it is sometimes practical in making difficult castings to provide a small extension on a chunky part of the section where the chilling effect of the molding sand would be least and to break off this extension. The fracture will show whether the metal is of the proper composition for annealing. It should be remembered that castings can be over-annealed, but at present this will not often occur.

Patterns.

In making patterns an allowance of ⅛ inch to the foot over the ordinary is made. Malleable iron shrinks more in the mold than gray iron, but in the annealing process a slight swelling takes place.

The first pattern is made of wood and from this the foundry patterns are made of aluminum. Without aluminum patterns the heavier castings could not be made economically as the old fashioned brass patterns required two or more men to handle them.

A pattern shop in a malleable foundry is a more important adjunct than formerly. The wood working department is still there, but in addition a small foundry for the aluminum castings and a machine shop with planers, shapers, lathes and drill presses, will be found. As in most foundries the foreman pattern maker represents a large part of the brains of the establishment and it is generally with him the engineer has to consult in regard to the feasibility of his design or for overcoming difficulties developed in the making of the casting.

OBITUARY.

Theodore D. Buhl, numbered in the first rank of Detroit's most prominent and successful business men, died suddenly in New York city, April 7. Mr. Buhl had started for a walk from the Waldorf-Astoria hotel, where he was a guest, when he was stricken with apoplexy and fell dead upon the street. He was alone at the time, his wife and grand-daughter who were with him in New York, having remained at the hotel when Mr. Buhl started upon his walk. In the death of Mr. Buhl the business world of Detroit is deprived of one of its most striking figures. Endowed with a keen business insight and forethought, which had made his father successful before him, Mr. Buhl was enabled to attain even greater achievements in a business way than his parent after he was called upon to take charge of the extensive interests of the latter. He was born in Detroit, Aug. 20, 1845, and was a son of Christian H. Buhl, one of the best known capitalists in Michigan. After obtaining his education in Detroit and New Haven, Conn., he entered into his father's business with his younger brother, Frank H. Buhl, who later became his partner in the Sharon Rolling Mills, Sharon, Pa. The latter's ill health and the death of the parent threw the major responsibilty of conducting the family's large interests upon the elder son. In the conduct of these affairs, he achieved great success. In his industrial interests, Mr. Buhl was president of the Buhl Malleable Co., president of the National Can Co., president of the Buhl Stamping Co., vice president of the Detroit Copper & Brass Rolling Mills, president of the Buhl Sons Co., president of Parke, Davis & Co., in addition to responsible positions in numerous banking and other enterprises. In the malleable iron manufacturing field, Mr. Buhl was particularly prominent. In connection with Thomas H. Simpson, he started the Michigan Malleable Iron Co., afterwards selling out this enterprise to W. C. McMillan and then organizing the Buhl Malleable Co. It is a peculiarly sad coincidence that Mr. Buhl's death occurred within a few weeks of that of the late W. C. McMillan. He was a man of a charitable disposition and many of the worthy institutions of Detroit had been the recipient of his benevolence. He possessed a natural inclination for art and last year served as the head of the Detroit Museum of Art.

Thomas B. Brannon, who had been superintendent of the Lewistown Foundry & Machine Co., Lewistown, Pa., for 37 years, died in that city on March 25.

CARNEGIE INSTITUTE DEDICATED.

The Carnegie Institute, Pittsburg, was formally dedicated on Thursday, Friday and Saturday, April 11, 12 and 13, with imposing ceremonies. The occasion was made exceptionally memorable by the presence of famous scientists and other distinguished men of learning from the old world, as guests of Andrew Carnegie, the founder, and by a great gathering of America's representative men on invitation of the trustees. This institution now comprises five great departments—the libary, the museum of natural history, the art gallery, music hall, and the newly created technical schools. The latter are built on a tract of land consisting of 32 acres, which was presented by the city of Pittsburg. The schools comprise four organic divisions and together provide a complete system of technical education. The School of Applied Science prepares youths of 16 who desire to take up some specialized calling such as architecture, chemistry, railroading, or electrical and mechanical practice.

On April 5 Mr. Carnegie presented to the trustees of the institute $4,000,000, doubling the previous endowment, and in addition $1,000,000 for a further extension to the technical schools, and $1,000,000 for use when these extensions are open to scholars.

BRASS FOUNDING

THIS DEPARTMENT IS DEVOTED TO THE TREATMENT OF ALL ALLOYS

ALUMINUM CASTINGS

By E. F. Lake

ALUMINUM was first discovered and developed in Europe. The practical evidence of its properties was first given by a French chemist by the name of Baron in 1760, but little was done with the metal until 1854, when a French chemist by the name of Deville, demonstrated its true properties and a German chemist named Wohler discovered aluminum in its true sense. Deville ordered a medal made which he presented to Napoleon III, and this caused the then French emperor to have more experiments made at his expense and led the French government to open its laboratory at Javel to Deville for further research, and samples of the metal made there were exhibited at the Paris exposition of 1855. In this year the first company to manufacture aluminum was organized at Rouen, France, but the expense of producing it was so high that this company only continued the manufacture about one year. Martin, a Frenchman, next organized a company and sold the metal at 32 cents per ounce and was successful. Deville kept up his experiments, and with M. Rousseau produced it so it could be sold for 25 cents per ounce, which was the only method of producing aluminum successfully up to 1883, and this was the starting point of the present electrolytic method. Chas. M. Hall, Oberlin, O., then caused a change in the production by perfecting this method for which he took out patents in 1899, and the Pittsburg Reduction Co., securing these patents, began the manufacture of aluminum. Their output the first year was 75 pounds per day, and the price $4.50 per pound. The second year they produced 400 pounds per day and the price was $2.00 per pound. The output of aluminum has been gradually increased from that time to the present, until it is many times that of 1900. The price, however, of aluminum ingots has been reduced from $2.00 per pound in 1900, to 45 cents per pound at present, and owing to the demands of the automobile business for light-weight and high-powered cars the demand for aluminum for castings is increasing rapidly.

Physical Properties.

The weight of aluminum is about one-third that of the other metals used for castings, its specific gravity as compared with other metals is as follows:

Cast aluminum	2.85
Cast iron	7.218
Cast steel	7.717
Cast brass	8.320
Cast bronze	8.832

This, and the fact that by the use of different alloys it can be made nearly as high in tensile strength as cast iron sharp blows with a hammer not breaking it as easily, it becomes an ideal metal for use on automobiles where great strength is not required, such as engine or crank

cases, transmission gear cases, inlet and exhaust manifolds, carbureters, friction cones, blower cases, steering wheels, fans, brackets, etc. One manufacturer makes bodies of cast aluminum. For castings it is generally alloyed with copper, zinc, nickel, brass and manganese, many of the ingots sold for casting being 15 per cent zinc to 85 per cent aluminum. Where high tensile strength is required, it is generally alloyed with from 5 to 7 per cent of copper, one 7 per cent copper alloy showing a tensile strength of 27,000 pounds per square inch,

Test No. 2.

Area	0.182 sq. in.
Tensile strength, per sq. in.	30,200 lbs.
Elastic limit, per sq. in.	17,600 lbs.
Elongation in 4 inches	2.75 per ct.
Reduction in area	5.00 per ct.
Specific gravity	2.99 per ct.

Aluminum Compared to Cast Iron.

The lightness, together with the toughness or elasticity which some alloys give aluminum makes it a better metal than cast iron for many purposes. Especially is this so of crank cases for the engines on automobiles, as in the case of crank case explosions the metal will give way and bend where cast iron

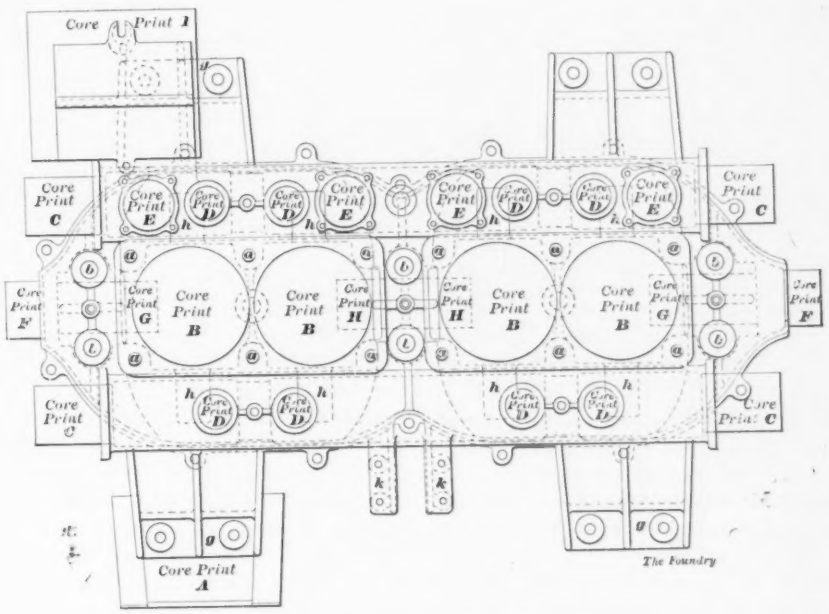


FIG. 1—AUTOMOBILE CRANK CASE

while pure aluminum only has a tensile strength of 12,000 pounds. Some foundries will guarantee a tensile strength of 25,000 pounds per square inch, and many other alloys will test from 17,000 to 20,000 pounds, but where the tensile strength is high the elongation is low, and where the tensile strength is low the elongation is high. This is best shown by the following tables, which are taken from tests made by a well-known brass and aluminum foundry:

Test No. 1.

Area	0.179 sq. in.
Tensile strength, per sq. in.	21,200 lbs.
Elastic limit, per sq. in.	8,400 lbs.
Elongation in 4 inches	8.25 per ct.
Reduction in area	9.5 per ct.
Specific gravity	2.84 per ct.

would break and the broken parts might get in the mechanism of the engine and cause serious damage. Also the racking of the frame, to which the crank case is bolted, while traveling over rough country roads would crack and break cast iron, while aluminum would bend and give. This, together with other uses, that the cheapening of the price of aluminum has brought out, has added a practically new product to foundries, and where the foundry output of aluminum was practically nothing eight years ago, there are today many foundries whose output of aluminum castings amounts to hundreds of tons per year. As it can be

handled as easily and with the same foundry rigging and materials as brass, nearly all the brass foundries that are not now casting aluminum are looking it up and preparing to do so.

Aluminum fuses at 1.157 degrees Fahrenheit, which is much lower than brass or bronze, and it has been melted successfully for casting by digging a hole in the foundry floor, building a coke or charcoal fire in it, and holding a crucible with the metal in it over that. With this method, however, sulphur fumes are liable to attack the molten metal and spoil the heat. It is also liable to be overheated, as it should be poured at the lowest possible temperature at which it will fill the mold, and poured as rapidly as possible to avoid its falling below that temperature.

Making Molds for Aluminum Castings.

In making the molds for aluminum the ordinary sands used for brass are all right for the smaller pieces, but for the larger or more complicated pieces a finer grade of sand, such as Windsor Lock, or the fine Albany sands should be used. These should be tempered as dry as possible and rammed in the molds as lightly as possible to avoid chilling the metal on its thin sections and give it the vent necessary, as the vent rod is not used except where pockets occur and there it should be vented to the bottom board. Risers should be liberally used, as where a thick section joins a thin one the thin section sets so quick that the thick section shrinks in, leaving hollow spots, and where it is not practical to use risers, chills should be used so that the thick sections will set as quick as the thin ones. Where bolt bosses occur it is well to use an iron rod to core the hole, as this will also act as a chill. Chills can be made of cast iron, brass, or any metal that fuses at a higher temperature than aluminum. Where a flat piece is to be cast a steel or iron plate ⅛ of an inch thick is sometimes placed in the mold directly under the pattern. If a test bar is chilled on three sides it will give more than double the tensile strength of an unchilled one. In the making of the cores, common lake sand is as good as any material that can be used, although some mix this with from 25 to 50 per cent of the finer sand that is used for brass molds.

Facing Cores.

For facing the cores nearly every foundry supply company has a special compound or wash which is made for aluminum, and by trying these the foundry can find out which one is best adapted, but for the molds, if a good grade of sand is used, no facing is necessary. However, if the molder has become so accustomed to using facing that he cannot close a mold without it, a light dusting of soapstone is as good as anything, although some have used a fine grade of plumbago and others charcoal for facing the molds.

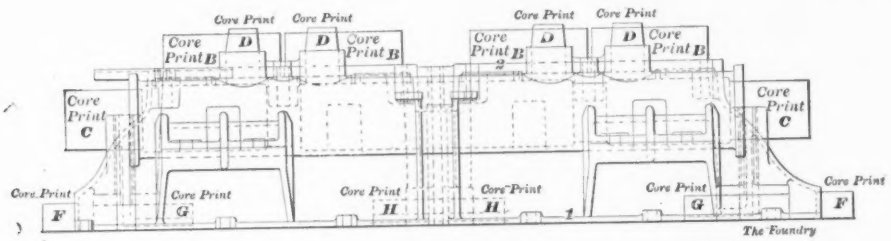


FIG. 2—CASTING SHOWING OPENINGS IN BARRELS FOR CAM SHAFTS

Designing Patterns.

In the designing and construction of the patterns, thin sections should be used with ribs and webs, as more strength will be obtained in this way than with thick sections, the casting will come out more perfect, and better results will be obtained in every way. The pattern should also be built so as to use green sand cores wherever possible, and no cores used on the outside of the pattern that it is possible to do without, as, in general practice, the core sand being coarser than the sand of the mold,

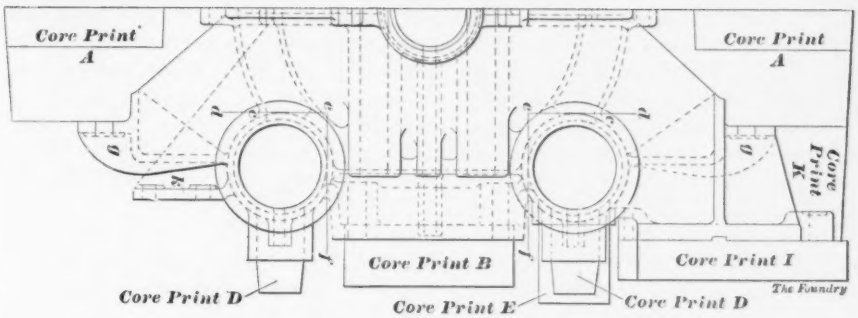


FIG. 3—OPENINGS FOR VALVE RODS SHOWN AT D

the metal cuts into it more when pouring and the contrast between the two surfaces is not pleasing to the eye. I have seen aluminum castings in which one could not tell the difference between the cored surfaces and the mold surfaces, which proves that the work could be turned out right, but in this age of rush the little things are overlooked and poor castings are the result. By using cores on the outside surfaces of the castings, however, fins are formed where the core sand and mold sand come together. These fins must be filed or chipped off, which leaves bright shiny metal and the rest of the surface has a dull, frosted appearance. The contrast between the two is much greater than in iron, brass, or any other metal that is cast, and therefore it does not present a good appearance.

Use of Fillets.

Good liberal fillets, well rounded, should always be used, especially where a thick section and thin one are joined together, as in cooling the metal pulls away from the corners and will cause it to check or crack if not well supplied with fillets. Aluminum castings in cooling also warp more than most other metals, and for that reason it is necessary to allow more finish on the casting than would otherwise be necessary. To illustrate this on the engine or crank case shown at 1, Fig. 2, it was necessary to allow 3-16 of an inch finish, but if it were not for the warpage, 1-16 of an inch would have been enough, as aluminum will clean up and present a very smooth surface, with only one light cut taken off by the planer or milling machine. It was also necessary to allow 3-16 of an inch finish at 2, Fig. 2, which is where the cylinder of the engine is bolted on, for the same reason. With the proper alloy, aluminum castings can be bent enough, when cold, to allow for the worst cases of warping, but if the alloy is not right they are more brittle than cast iron.

Shrinkage.

The rules for shrinkage, in the construction of the pattern, are not as positive as those of any other metal that is cast, but with the improvements in the reduction of the metal and the experiments with different alloys that are going on, we can live in hopes that some day they will be more certain. Some foundries send out the rule that 7-32 of an inch to the foot should be allowed for shrinkage, but as very few patternmakers

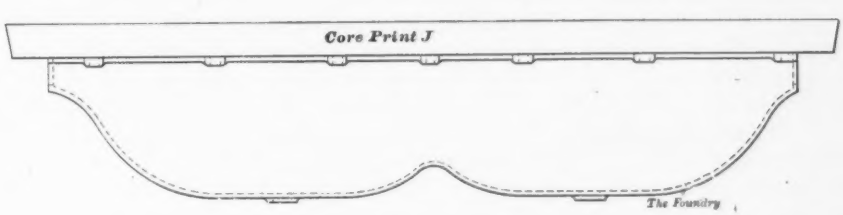


FIG. 4—LOWER HALF OF CRANK CASE

have that kind of a rule, do not have courage enough to make one on the company's time, and do not know where they can buy one, the pattern is usually constructed by a shrink rule of 2-10 or 3-16 of an inch to the foot. On small patterns the difference does not amount to much, but when they get to the size of the one I have illustrated and where the top half and the bottom half of the case must fit together, so that the bolt lugs will all come together and one not overhang the other, then the shrinkage is a problem, as, if they do not fit, the machinist that has to put them together will complain. However, even after all the care was taken that was possible in the construction of the two patterns as to the fit of the lugs and shrinkage, I saw two castings similar to Figs. 1 and 2, which were cast in the same foundry with the same alloy on the same day and from the same pattern, one of which shrank 7-32 and the other only 2-32 of an inch to the foot, so that when the engine cylinders were bolted on, one pair was a fit and the other pair overhung the case ⅛ of an inch on each end. Then again, large castings do not shrink the same as small ones, thin metal does not shrink the same as thick, and different shaped castings have different shrinkages so that the rules for actual shrinkage are only gained from practical experience. However, for all practical purposes, 3-16 of an inch to the foot is a good rule to use in the building of patterns for aluminum castings.

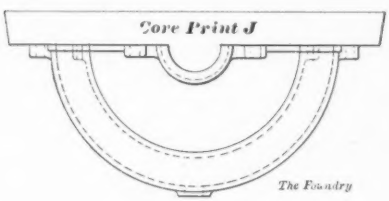


FIG. 5 —SECTION, LOWER HALF OF CRANK CASE

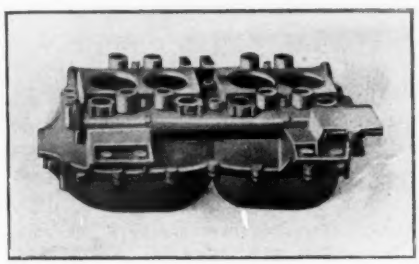


FIG. 6 —CASTING ASSEMBLED

Crank Case Castings.

The casting I have illustrated, Figs. 1 and 2, is the most complicated and one of the largest that is being cast in aluminum. Core prints C, Figs. 1 and 2, show the openings in the barrels in which the cam shafts run. At core prints B, Figs. 1, 2, and 3, is shown the opening through which the pistons and piston rods run. At core prints G and H, Figs. 1 and 2, are shown the bearings in which the crank shaft runs. At core prints D, Figs. 1, 2, and 3, are the openings for the valve rods. At G, Figs. 1 and 3, are the feet, with which it is bolted to the frame of the motor car. At core print I, Figs. 1 and 3, is the bracket to hold the magneto which provides the spark to light the gas in the engine cylinder, and at K is located the brackets to hold the pump which drives the water through the cylinders for cooling them.

This pattern could have been made for a 2-part flask by coring under the cam shaft barrels at C, Fig. 3, but if this were done it would leave a fin on the center line of the barrels the entire length of the castings and on both sides of it, therefore, it was decided to make it in a three-part flask, as in that way no fins would be on the outside of the casting and the outside would be all in the green sand mold, except under the feet at core prints A, Figs, 1 and 3, and as this part of the casting was out of sight it would not make much difference if it did show where the fins were cut off; or if a rough surface was caused by the core sand. In order to mold it in a three-part flask the cam shaft barrels were left loose and joined to the rest of the pattern on the lines d, e, f, Fig. 3. To one of these barrels was fastened the two water pump brackets K K, and as the ribs under them, for support, were only ⅛ of an inch thick and loose from the parting line of the barrel down to the bottom of the pattern, they were made of brass. The magneto bracket

which is on the opposite side and to one end was put on loose and was molded by the use of a covering core as shown at core print I, Figs. 1 and 3.

Method of Molding.

This pattern is molded by placing it on a board with the flat side, to which is bolted the lower half, down, placing the cheek over it and ramming the sand up to the lines d, e, Fig. 3, where it is struck off for the parting between the cheek and drag. This parting, however, is carried up to the top of the feet when they are reached, making it an irregular one. The drag is then placed on, chills are placed around the bolt bosses b, Fig. 1, as the metal here is so much thicker than the rest of the casting, which in this case is 3-16 inch thick, and the balance of the pattern is rammed up. Core print 1, to which is attached the magneto bracket, is then drawn out, the covering core put in and covered over with sand, the bottom board put on and the mold turned over. The main body of the pattern is then drawn out, after which the cheek is taken off and the cam shaft barrels drawn out.

Cores.

The mold is then ready for the cores, which are placed in the following order. First.—The cores which form the openings at core prints E, Figs. 1 and 3. They have been made separate, so that the cores which form the opening for the cam shafts, with the openings for the valve rods at core prints D, could be made in one core box that would fit both sides of the mold. Second.—The core that forms the pocket between the magneto bracket and foot is located in core print K, Fig. 3. Third.—The cores that form the opening for the cam shaft are located in core prints D and C. On one side this core rests on the cores already located in core prints E. The cheek is then put on. Fourth.—The cores that form the pockets under the feet are located in core prints A. These core prints have a projection on each side which prevents the core from tipping in the mold without the use of an extra long print to balance them. This enables the molder to use a much smaller flask than he would otherwise. Fifth.—The main body core, which is in two parts, being parted by the rib in the center, is located in core prints B. These cores have chills set in them to take care of the thick section of metal at the bolt bosses, A, Fig. 1. Sixth.—The cores, which form the pockets around the crank shaft bearings at both ends are located in core prints G, which are in the main cores, and core prints F, which are in the mold. Seventh.—The half round core, which cores out the center bearing, is located in core prints H H. This holds the main body cores in line, so that when the cope is placed on they will stay in position. With this style of setting and locating the cores, all core prints in the cope are done away with and a flat cope can be used.

Lower Half of Crank Case.

Figs. 4 and 5 illustrate the lower half of the crank case, which is half round and can be turned in the lathe. The best results are obtained in the foundry by molding it with an overhanging core print, as shown by core print J, as a flat cope can be used and it does away with all wiring and hanging of cores, while no larger flask is necessary to mold it in, as the core print can come way to the edge of the flask if it need to. Fig. 6 is a view of the two castings assembled.

NEW STEEL CASTING PLANT.

The Bucyrus Steel Casting Co., Bucyrus, O., has commenced operations in its new open-hearth steel plant with a daily capacity of 60 tons, which will be doubled by Aug. 1, when extensions now under way are completed. The foundry is 160 x 305 feet, with a 65-foot span in the main building and a 45-foot span in each lean-to. The basic furnace is equipped for either oil, natural gas or producer gas, but oil is employed at present. The foundry is equipped with three Niles cranes, one of 10-tons capacity in each lean-to and one 25-ton in the main bay. The company also uses pit annealers. Power is supplied by two 300 horsepower Bass boilers, two 250-kilowatt Fort Wayne Foundry & Machine Co.'s generators, two 250 horsepower Bass engines, Corliss type, and one Ingersoll compressor, with a capacity of 800 cubic feet of air per minute.

BRASS FOUNDRY NOTES

By C. Vickers

Question.—Will you kindly advise the best method of removing or reclaiming brass from rumbling mud, that is, mud or washings obtained from mills in brass foundries? We are operating a brass foundry and our rumbling mud seems to be especially rich in brass, but we have as yet failed to find a satisfactory method of removing the same from the dirt.

Answer.—The mud must be washed to obtain the brass. To do this you will need in the first place, a brass screen sieve of No. 32 mesh and a half barrel or other receptacle for water, sufficiently large to allow the sieve being handled therein, so as to wash away the mud from the metal. A common kerosene barrel, cut in half can be used, but it would be better to get a larger barrel, or better still a rectangular tank.

There is a little trick in manipulating the sieve, but this can be learned with a little practice. In commencing operations the tank is filled with water, of a temperature that will allow the hands being submerged without being chilled. A shovelful of mud is then placed in the sieve, which is lowered into the water, so the upper rim is above the same. The mud should now be liquified, by stirring with the hand or agitating the sieve, the idea being to wash away the mud, while it is held in suspension by the water, and still retain the brass in the seive. This operation is facilitated by inclining the sieve at an angle of about 40 degrees and drawing it through the water so it flows through the screen, the stream carrying away, over the rim of sieve, the dissolved mud, and such light particles as pieces of coke, wood, etc.

At the end of each stroke, or draw, the sieve is lifted clear of the water, its contents given a toss to throw the brass back on the screen.

It is then dipped into the water again and drawn along, the motion being generally from left to right. This operation is repeated until the metal shines bright and clean. The more dirt that is washed out, the easier the metal will be to melt.

After the brass is separated, the bits of clinker can be picked out, the iron removed with a magnet, and the skimming thrown into a barrel to await the melting operation. The crucible should be filled with the skimmings two or three times as they settle down; the fire should be strongly urged, until the slag can be kneaded with the poker. The crucible can then be withdrawn, and skimmed, the metal being poured into ingots or into castings, or it can be skimmed while in the furnace, and refilled with skimmings as thought best, the operation being repeated until the crucible is sufficiently full of metal. A good skimmer for this purpose is formed by a piece of angle iron, about four feet in length, with a crook on one end, with which the slag is fished off the metal.

Another method of disposing of skimmings is to use a certain proportion in each pot of metal. In this manner they are run down, without extra expense. The difficulty is, however, that they are liable to be forgotten, and keep accumulating until they are a nuisance. They are very valuable as a cover for the metal when used in this latter manner as the melted slag covers the surface of the molten brass and prevents oxidation, and this is the way I prefer to use them. The amount of metal contained in washed skimmings is 70 per cent.

USE OF FRENCH SAND.

Question.—Will you kindly advise us if French sand has been used in brass foundries for molding fine builders' hardware, and if so, with what success? Where can this sand be secured? We would also like to know the type of the best floor for brass foundries making work of this character. We have tried earth and

brick with indifferent success and are anxious to improve the same.

Answer.—French sand is rarely used in ordinary brass foundries, its use being largely confined to makers of statuary. Should you wish to try it however, it may be obtained from Cutter, Wood & Stevens, 68-70 Pearl St., Boston. Its cost is one dollar per 100 pounds, and comes in casks of about 800 pounds.

There are other sands that will answer your purpose just as well, and are much cheaper and may be obtained from most of the supply houses.

A floor of cast iron tiling is undoubtedly the best and most durable for a brass foundry. It is formed of square or rectangular plates of cast iron, of any convenient size. The side of the plate forming the floor should be roughened, by having projections cast on.

To avoid the danger of slipping many brass foundries, use cement for the floor. Such floors being smooth are nice to sweep up, and the spillings of brass are thus easily cared for,—but, they are also dangerous, when molten metal comes in contact with them as in the case of a "run out" or a "leaky pot," as the cement under the hot metal explodes with such violence that the brass is hurled in all directions, often resulting in serious accidents.

BRONZE MONOGRAM PAPER WEIGHTS.

Question.—I have some monogram paper weights to make of bronze and cannot get them sufficiently smooth. I am using "B. Y." sand without facing, charcoal for parting, and am gating the molds with a horn gate, that no grinding or finishing may be required. I want to give them a smooth bronze effect without having any place bright. They weigh one pound each. Have tried making the molds with the face up and face down and presume that some method similar to the one used in the casting of art hardware would answer the purpose.

Answer.—If the castings come rough, your sand is too coarse. Get a barrel of prepared brass sand and use it as a facing on the monogram. You can procure such sand from any dealer in foundry supplies. It comes in barrels, is a dry, powdery sand of a reddish color. In using temper in the usual manner with water, and sieve onto the patterns through a No. 16 sieve. A barrel will cost about four dollars, and will last a long time, used merely as a facing.

You should also use lycopodium for all such work, if you desire a perfect impression. Charcoal, either with or without the addition of rosin, is a poor substitute, and should never be used as a parting between the pattern and the sand, where fine work is desired.

In using lycopodium on such a thing as a monogram, first lightly dust the pattern, then, gently blow off, so that the lycopodium enters the crevices, then another cautious shake of the bag, and the surface of the pattern is covered with a very thin deposit on top of which the prepared sand is sieved, the sieve being held close to the work, so the falling sand will disturb the lycopodium as little as possible.

If you do not desire to secure special sand for this job, you can obtain a fine surface by "returning your pattern" or "printing back" as it is called.

Make the mold as usual, lifting the impression of the monogram if possible in the cope. Spray the sand gently with molasses water and dust the sprayed impression with beam dust. Shake lycopodium over the impression liberally and dust a little over the patterns in the nowel, taking care first that they are perfectly clean, then return the cope, and lightly go over the same with butt rammer.

On lifting the cope you ought to get a perfect impression, every line and curve standing out clear and distinct. If you have been sparing with water, possibly the mold can be cast green, a trial will determine this point, if not skim dry with a hot plate, or a blow torch. The torch, however, must be

used with caution, the plate being best on such work.

"Beam dust" is the dust that settles on all beams and ledges in the foundry; it is exceedingly fine sand, and in "printing back" should be dusted onto mold from a bag of suitable texture.

It may be used as a facing if you have plenty of it. Lacking beam dust use burnt sand, dusted through a fine bag, for printing.

UNITED STATES STANDARD BRONZE.

The following letter has been received from Bureau Bros., the well-known statuary founders of Philadelphia. As will be seen, it concerns an inquiry for a formula for brass statuary answered in the March number of THE FOUNDRY. The spirit which prompted this company to offer its formulas to the trade, is one that can be followed with profit by other brass foundries. It is by the exchange of these experiences that the whole trade is benefited, and we would like to receive from time to time information regarding alloys for special work, methods of melting and molding, and sands used for different grades of work. The letter follows:

"Noticing your mixture for bronze statuary in the March issue of THE FOUNDRY, would state from the 60's to the 80's the formula agreed upon by Col. Casey, representing the United States government, and Achille Bureau, was as follows: Copper, 90 pounds; spelter, 7 pounds; tin, 3 pounds; with the addition of ½ pound of lead.

"Since that period the following mixture has been formulated and adopted and is used as United States standard bronze: Copper, 90 pounds; tin, 7 pounds; spelter, 3 pounds; or copper, 90 pounds; tin, 5 pounds and spelter, 5 pounds; with the addition of ½ pound of lead in each case.

"We deemed it advisable to mention this, in order that the standard might be known."

LABORATORY BRASSES AND BRONZES

By C. B. C.

TWO samples are used to effect a saving of time, one to go for tin, lead and copper, the other for zinc and possible iron. For tin, lead, and copper, one-half gram is weighed and brushed into a 150 c. c. capacity Jena beaker, with watch glass. Introduce to the sample 10 c. c. 1:42 sp. gr. nitric acid, which will effect its solution in the cold. Place on an asbestos covered hot plate, and evaporate quickly to just short of dryness, the solution becoming pasty. Remove the beaker and contents and wash the watch glass cover and sides of the beaker with hot water, aiming to have about 30 c. c. solution after washing. Place to heat again and allow to stand without boiling, until all the meta-stannic acid has settled to the bottom, which is indicated by the solution becoming perfectly blue, with a clear, sparkling, crystal appearance. Filter into a 250 c. c. capacity Jena beaker on a 9 c. m. No. 589, S and S, double paper, washing thoroughly with hot water. Place residue into a No. 1 Royal Berlin porcelain crucible. Dry and then char the paper. Then burn off the paper, finally using a strong blast, igniting to stannic oxide. Intense ignition must be used, as stannic oxide will hold some water. Weigh as stannic oxide, which contains 0.78808 per cent of tin.

To the filtrate add 5c. c. 1:84 sp. gr. sulphuric acid, and evaporate with a medium heat, sometimes very slowly,

if much lead is present, to prevent bumping, to very copious fumes of sulphuric anhydride. Remove from the heat and allow to cool, until the hand can hold the beaker. Wash the watch glass and sides of beaker with 2 per cent sulphuric acid, washing enough to cause dilution of the concentrated acid in the beaker to make practical the filtering of the lead sulphate formed. Allow to stand, with frequent stirring to dissolve out all the copper sulphate from the lead sulphate. Filter into a Jena beaker, 250 c. c. capacity, on to a double 9 c. m. S and S paper, washing well with 2 per cent sulphuric acid. Place the precipitate into a No. 1 Royal Berlin porcelain crucible and dry, then char, and carefully burn away the paper. Finally bring the crucible to a cherry red. Weigh as lead sulphate containing 0.68298 per cent of lead.

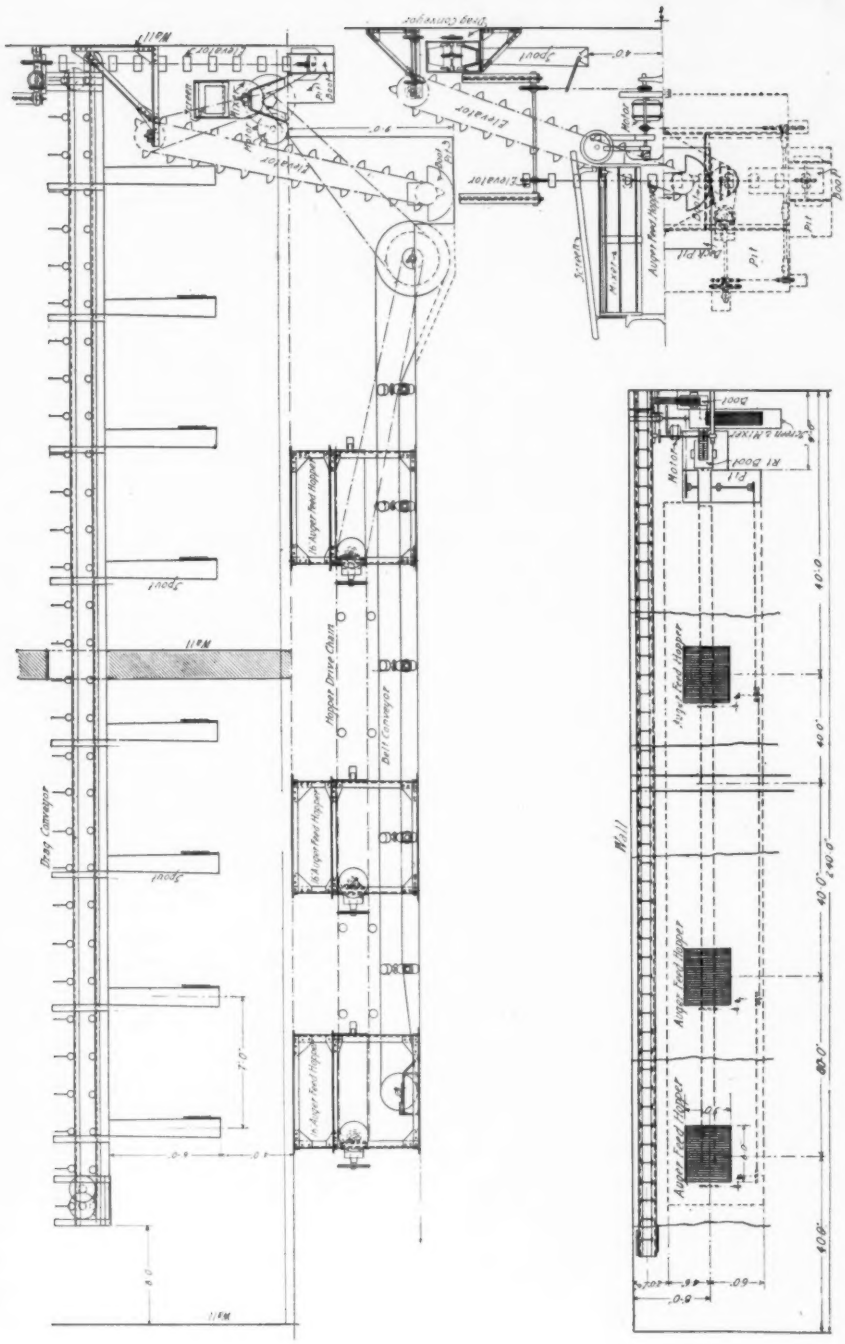
Ignite, and weigh a platinum cone, dish or plate. Add to the filtrate from the lead sulphate, 6 or 7 drops 1.42 sp. gr. nitric acid. Place solution in platinum dish and insert plate, or put cone and spiral in beaker. Attach battery wires, so that the copper precipitates on the weighed surface. After eight or nine hours, test by taking out a drop on a watch glass and add a little hydrogen sulphide water. If more than a trace of copper, the faintest brown color appears, and the precipitation is not complete, but when it is, siphon off the solution without interrupting the current, letting in water at the same time, until all the acid solution is gone. Then disconnect the cone, wash the copper with alcohol, and dry at 100 degrees C. The alcohol can be burned off, after which the copper is generally dry. The increase in the cone weight is the percentage of copper.

Iron and zinc determination. The other sample is run at the same time and is finished by the copper determination. One-half gram is brushed into a 400 c. c. capacity Jena beaker, and 10 c. c. 1:42 sp. gr. nitric acid introduced. Evaporate all nitrous fumes and add to the nitric acid solution 5 c. c. 1:84 sulphuric acid and evaporate until dense fumes of sulphuric acid appear. Sometimes big bumping occurs, which is due to too much zinc with the lead. To overcome this use a milder heat. Allow to cool and add 200 c. c. cold water and stir well. Run in briskly for 15 minutes hydrogen sulphide gas. Filter on a 15 c. m. No. 589 S and S single paper, washing well with 2 per cent sulphuric acid. Throw this residue away. Put filtrate caught in a 600 c. c. capacity Jena beaker on the bare hot plate and boil hard until all hydrogen sulphide gas is gone, which can be told by smelling the solution, and also by its clear, sparkling appearance. Allow to cool and add enough ammonia water (0.90 sp. gr.). The ferric hydroxide is filtered on a single 9 c. m. No. 589 S and S paper, and placed in a No. 1 Royal Berlin porcelain crucible, and paper dried, charred and burned off and ignited at a gentle heat. Weigh as ferric oxide containing 0.7000 per cent iron.

The filtrate is heated up to boiling and should smell strongly of ammonia. Add 25 c. c. mercuric chloride solution (100 grams mercuric chloride, 100 grams ammonium chloride, dissolved in 2,000 c. c. water). Run in briskly for 15 minutes hydrogen sulphide gas, throwing down both sulphides, copper, and mercury. Filter on a 12½ single No. 589 S and S. Place in a No. 1 Royal Berlin porcelain crucible. Dry, char, burn and ignite. Weigh as zinc oxide, containing 0.80313 per cent of zinc.

REBUILT THE BOUNDARIES.

The American Foundry & Furnace Co., is getting into shape for the summer season, which is the busy one in that line of business. The firm made several important improvements in its plant last summer, including the rebuilding of its boundaries and making them fire proof. The summer is the greatest shipping season for this concern, and hundreds of carloads of its products go out during the season.—Bloomington, Ill., *Pantagraph.*



SAND CONVEYING SYSTEM INSTALLED IN THE BRASS FOUNDRY OF THE METRIC METAL WORKS, ERIE, PA.

AUTOMATIC SAND CONVEYING SYSTEM.

A sand conveying plant with a capacity of 20 tons an hour, plan and elevation of which is shown in the accompanying illustration, is being built for the brass foundry of the Metric Metal Works, Erie, Pa., by the Standard Sand & Machine Co., Cleveland.

The foundry is 240 feet long and 40 feet wide, and in addition to the Berkshire molding machine, sand is to be delivered to the bench molding department. The equipment provides for three automatic auger feed hoppers into which the sand is shaken out. These hoppers are covered with grates 5 x 6 feet in dimension, and are equally spaced the length of the foundry. From the hoppers the sand is delivered to an 18 inch belt conveyor by the 16 inch conveyor augers, passing underneath the foundry floor through a tunnel 168 feet long. The belt conveyor delivers the sand to the screen and the automatic mixing and tempering machine located at one end of the plant, from which it passes to the drag conveyor, 232 feet long, provided with 36 spouts through which the sand is delivered to the molding machines and bench molder's floors. These spouts are six feet long, are four feet above the floor level and are spaced seven feet from center to center. The entire equipment is operated by a 17 horsepower motor.

The entire plant is automatic and requires no labor for the handling of the sand, beyond the shaking out of the molds into the feed hoppers at the floor line. The feeding of the sand is regulated by speed of the conveyor augers in these hoppers. The mixing and tempering machine is provided with a water tank, with float valve and spray pipe, for automatically tempering the sand, as the sand moves through the drag conveyor. It fills the first down spout which is provided at the lower end with a shutter, after which the sand passes to the second spout and so on down the line, with an excess overflow at the extreme end of the drag conveyor to supply the last down spout with the necessary amount of sand.

HOT-SHOT

Foundry operations on the banks of the exuberant Ohio, despite their many drawbacks, have their redeeming features. The never-failing floods which annually precede the vernal equinox, in addition to affording the molders and coremakers an opportunity of ridding themselves of the recurring attacks of spring ennui, permit of a cessation of operations for repairs and much needed housecleaning. The latter is usually accomplished by means of a stream from a fire hose, which rapidly removes the alluvial deposits which have fondly embraced all of the foundry furniture while the river was at high tide. The great newspaper losses reported are rarely known outside the editorial sanctums where "extrees" are now mixed by analysis instead of fracture. Furnaces and ovens in most of the plants are raised above the high water mark, but this beautiful stream, which, chameleon like, converts itself into a dusty road during the torrid months, occasionally raises the limit. Its last attempt to deliver large sections of the presidential state and the home of the Bourbon to the placid Mississippi was a worthy effort, and resulted in the establishment of a new high record.

* * *

The boom is on down at Pleasanton, Mo. The first "vat" of molten metal has been "pulled" (whatever that is) in the new foundry built at that place, and the initial operations have been vividly described by the editor of the *Enterprise* as follows:

"At the invitation of Dr. Henry Plumb, last Saturday, the editor of the *Enterprise* went over to the Pleasanton Foundry and Machine Co.'s building and witnessed their attempt at making their first trial of

doing work in the foundry line.

"The big vat of molten metal was soon ready to be "pulled" and poured into the molds in which patterns for castings had been prepared by the foreman, Mr. Adams, and were for a big building in Kansas City. Everything worked like a charm. The metal was drawn and poured into molds and the crowd waited expectantly to witness the success or failure of the experiment, and when the metal had cooled sufficiently to permit the removal of the molds from around the castings it was at once seen that they were the most perfect that they had ever seen, and a gladsome cheer showed itself upon the faces of all present. Harry Adams, the foundryman, seems to thoroughly understand his business and Pleasanton was certainly fortunate in securing the service of such an expert to start out with."

* * *

For the benefit of manufacturers of malleable and gray iron castings wishing to compete with the United States Steel Corporation, the following short cut to wealth and happiness is given: "Claim.—The mode herein described of converting castings into steel or malleable iron consisting in heating the iron in a closed chamber, to a point slightly short of the melting point of the iron; then introducing into the chamber sulfuric acid unmixed with any other reducing agent and continuing the heating, effecting the decomposition of the sulfuric acid and enabling the oxygen therein to act on the iron substantially as described."

Mary A. Hunter, of Philadelphia, enjoys the exclusive right to this process.

BRITISH NOTES.

There has been a marked increase in activity among the heavy iron foundries of South Staffordshire during the last few weeks. The makers of mill rolls are very busy and a large proportion of these orders have come from the north of England and South Wales. In the latter district the run on tin plate has stimulated the orders for rolls. There are only four foundries in that district, and it would seem that for the highest qualities, the tin plate rollers come to South Staffordshire. This seems a little curious, in view of the fact that the Midlanders apparently have no special advantage in geographical location, and, of course, the South Wales buyer has to pay the cost of carriage. South Staffordshire men have been producing the highest kind of chilled rolls, and the Welsh orders are tributes to their reputation as casters.

Arrangements are being made for the final selection of the meeting place for the annual conference of the British Foundrymen's Association which is to take place, as it did last year, in the August bank holiday week. Three important engineering centers have been named, Halifax, Newcastle-on-Tyne, and Sheffield. All will furnish the requisite opportunities for visits to large establishments. The choice of the place will rest with the members themselves to whom circulars have been issued inviting their suggestions. Several papers will be read and the arrangements generally will be on similar lines to those of last year's conference. As the membership is larger it is assumed there will be a more numerous attendance than on the last occasion.

The bestowal upon A. H. Hiorns of an honorary membership in the Birmingham branch of the Foundrymen's Association, a compliment bestowed at the last meeting of this organization, was a sincere recognition both of personal qualities and practical services rendered to foundrymen by Mr. Hiorns. The Birmingham expert has for many years been at the head of the technical staff of the metallurgical department in the municipal school, and his affability and general spirit of helpfulness have made him extremely popular with all metallurgical students. He has been president of the Birmingham Metallurgical Society since its commencement some years ago, and is the author of a number of works.

A SIMPLE FOUNDRY COST SYSTEM*

Forms for Jobbing Work Including Order Blanks for Various Foundry Departments

By F. C. Everitt

MANY foundries now handle besides their regular line of castings, more or less jobbing work for outside firms. The amount of work turned out in this particular case is from 4 to 5 tons per month of castings varying from 5 pounds to 500 pounds. To keep a record of the patterns, many of which are returned when the castings are delivered and to provide a quick, simple, and economical cost system, the following has been gradually introduced to meet these requirements. The system furnishes the cost from the molding department only. The machine and other departments report their costs, if any, to the head cost clerk, who reports the total cost to the main office. The form, Fig. 1, is the order received from the main office. Upon its receipt a rough sketch is made and dimensions taken, and an order, Fig. 2, is issued to the cleaning shop foreman, who

-7180-

THE J. L. MOTT IRON WORKS.

Shop Order No. 9170 FEB -3 1905 190

For Mr John Smith
New York City

Mark

Ship by

Packer

Packages

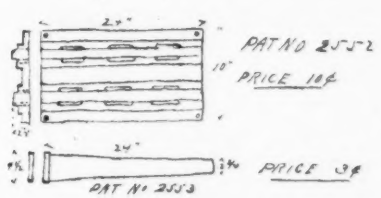
Weights

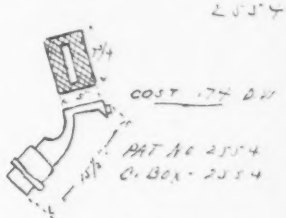
Promised MAR -1 1905

ORDER TO
FEB - 3 1905
CLEAN DEPT

PAT'S. RET'ED. COMPLETE
MAR - 1 1905
REC'D BY

Make 64 castings from 24 x 10 slab. PAT NO 2552
" 400 Plugs for 24 x 10 slab " 2553
" 3 Spec connections 2554





See Floor No. 82 2/3

See Floor No. 90 2/4

FIG. 1.—ORIGINAL OFFICE ORDER

*Read before the New York Foundry Foremen's Association.

delivers the castings to the shipping department. This order gives him full information in regard to the job. Another order is issued to the core department for cores, as shown in Fig. 3. The foreman coremaker is then fully informed, by his order, on his part of the work. The work having been put in the sand, of the sand during the month (The book here described is used for all work in the foundry, regular and jobbing).

After entry is made in the daily record book, the original order is filed. Strict attention being given to the daily record of the molder to see that all work is proceeding as ordered. The first work

IRON FOUNDRY.

TO CLEANING SHOP FOREMAN:—

ORDER TO
FEB - 3 1905
CLEAN. DEP'T

THE CASTINGS FROM THE FOLLOWING PATTERNS ARE FOR

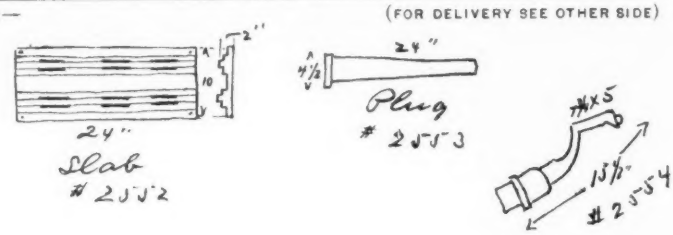
John Smith
New York

ORDER NO. -9170- DATE ORDERED Feb 3 1905

PAT. NO.	NO. ORDERED	DESCRIPTION	MOLDER NAME	MOLDER FLOOR NO.
2552	64	24x10 Slab.	E. Burns.	82
2553	400	24x10 " Plugs.	"	82
2554	3	Spec Connect.	C Connelly	90

TOTAL WT. 7892 LBS. NO. CAST'S DEL'V'D 467

SKETCH:— (FOR DELIVERY SEE OTHER SIDE)



SIGNED J Jones

FIG. 2—ORDER FOR CLEANING SHOP FOREMAN

the molders' number and date in the sand is written on the original order. Entry is then made in the daily record book, Fig. 4. This book has 800 pages, good for one year, each page 15 x 15 inches; one page is allowed for a molder and it gives in detail his work for one month. At the end of the month the book is rewritten and the work carried forward, omitting, of course, all work taken out completed will be the cores. The foreman coremaker, on learning from the cleaning shop foreman that the castings are good, returns his order for cores to the foundry office, has his stub Fig. 5, signed, and holds the same for future reference, if necessary. The cost of the cores is at once figured up and the order attached to the original order, Fig. 1. When the remainder of the castings are

completed and found by the cleaning shop foreman to be satisfactory, he at once notifies the shipping clerk by using the form shown in Fig. 6. has his stub, Fig. 7, signed, and copies of both stubs are sent to the foundry office and at-

the shipping department calls for the castings, the cleaning shop foreman stamps his order, Fig. 2, on the back, which may be part or final delivery, giving number of castings, total weight, date delivered, and by whom received, and

IRON FOUNDRY.

TO CORE DEPARTMENT:—

DATE Feb 3 1905

MAKE 3 CORES

from Plaster Core Box

FOR John Smith

ORDER NO -9170-

PAT. NO 2 5 5 4 C. B. NO. 2 5 5 4

ORDERED FROM OFFICE Feb 3 1905

MOLDER C. Connelly FLOOR NO. 90.

TIME CARD:—CORE MAKER J. Hayes. NO. 50

DATE	NO.	TIME	DATE	NO.	TIME	DATE	NO	TIME	DATE	NO	TIME
2-4	3	1 hr									

NO. MADE 3 RATE PER HR. 24 TOTAL COST 24

ORDERED BY J. Jones.

COMPLETED Feb 4 1905

SIGNED J. Hayes.

RETURN TO F'DRY OFFICE WHEN ORDER IS FILLED.

FIG. 3—CORE DEPARTMENT ORDER

tached to the original order. By this transaction the shipping clerk knows the goods are ready, the cleaning shop foreman holds a memorandum that he has notified the shipping office and the foundry office is informed that this matter has been properly attended to When the receiver of the castings signs where stamped.

If the patterns are wanted at this or any other time the foundry office is notified and the original order, Fig. 1, referred to, and stamped on the face, (patterns returned complete date , re-

Sheet No.	S. O. Number	ARTICLES	Moulder's No.	Price	Average Weight	Make	In Sand	CASTINGS PER DAY 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	Total	Completed	Forwarded from last Mo.
7160	9170	C. Barnes.									
		24 x 10 Shaft	52	12	—	6 2/3		7 8 - 8 8 8 8 8 - 13	64 2/4		—
		" Plugs	53	3	—	420 2/3		10 20 - 20 20 20 20 20 - 20 20 20 20 20 - 20 20 20 20

IRON FOUNDRY.

CLEANING DEP'T:—

To Office Date 2-3 190 5

The castings on Order No. 9170

From Pat. Nos. 2554-2 - 2554-3 - 2554-4

For Mr. John Smith

Are now ready for delivery.

Date Ordered 2-3 1905 No. Ord'd 467

Signed C. Edmunds. S. Clerk

CLEA. DEP'T STUB.

FIG 7—CLEANING DEPARTMENT STUB

ence, if necessary. This order is then attached to the original and the cost immediately figured.

The cost of molding on pattern No. 2554 is found by referring to Fig. 9, the day work time card. This card is made up daily on the floors and each job treated the same as the one mentioned. The cost is found to be $0.7. and a note is made on the original order Fig 4. All necessary information is then found on the original order and is entered in the cost book, Fig. 10. This is a 500-page book 16 x 12 inches, with index in front.

The total cost of the work amounts to $23.92, and adding the day work, cores, and rigging, the total cost of molding is $25.90. The weight being given, 7,892 lbs., we find the molding per pound to be $0.0033. Adding shop expenses and cleaning, the cost is $0.0058 per pound. With iron from the cupola at $0.01, the total cost to manufacture is $124.69, or $0.0158 per pound. The final cost having been determined, forms shown in

ORDER NO. 9170

ORDERED 2-3 1905

BY J. Jones.

FOR John Smith

PAT. NOS. 2554-2, 2554-3, 2554-4

MOLDER C. Connelly, E. Burns.

FLOOR NO. 82 & 90

NO. ORDERED 467

NO. DEL'V'D 467

COMP'D Feb 28 1905

SIGNED J. Jones

CLEANING SHOP STUB.

FIG. 8—CLEANING SHOP STUB

Figs. 2, 3, and 6, are all attached to the original order and filed for record, and afford a very quick means of obtaining any information in the future.

TIME CARD. FOUNDRY

DAY WORK MOULDERS.

(SIZE 14" X 6½") DATE Feb 4 1905

FLOOR NO.	ORDER NO.	PATTERN NO.	ARTICLE	TIME HRS	HELP	CORES	RIGGING	WEIGHT
90	9170	2554	3 Spec. Connec.	2	—	3	—	70

FIG. 9—MOLDERS' TIME CARD

MONTH February YEAR 1905

DATE ORDERED	ORDER No.	PAT. No.	ARTICLE	P. W. PRICE	MOLDING COST: P. W.	D. W.	CORES	RIG	TOTAL	PER LB.	Per Lb. Clean. and S. Exp.	IRON: TOTAL W. T.	COST	COST TO MFG'R: TOTAL	PER LB.	SELG. PRICE PER LB.
2 9110			Setting Crucible													
	2502		64 Castings from 24x10 Mold					1.00								
	2503		400 Rings for			3 23½										
	2504		3 Sets Connections				7.24		$3.90			7.92	$7.92	$24.90		

FIG. 10.—SHEET FROM COST BOOK

SEAMED CASTINGS.

In discussing the subject of seaming or rat-tailing, so frequently experienced by manufacturers of stoves and hollow ware, R. H. McDowell, in *The Obermayer Bulletin,* claims that this trouble occurs more frequently when a new carload of coke or iron is used. Seamed castings, he says, will be found to be either hard or brittle and when the castings are broken the fracture will have the white appearance of iron high in combined carbon or sulphur, or will have the dead, cinder-like appearance of iron high in graphitic carbon, with perhaps an excess of silicon. He suggests the use of a good grade of foundry iron, which should be low in sulphur, carbon, phosphorus and silicon, and which should be melted with a grade of coke low in sulphur and phosphorus.

GUN METAL LINERS.

Referring to the article on "Gun Metal Liners," by C. Vickers, in a recent issue of THE FOUNDRY, I wish to state that I have had considerable difficulty along the same lines as outlined. I am now using the following mixture: Copper, 88 per cent; tin, 10 per cent; zinc, 2 per cent. I find the latter exceedingly desirable for fluxing purposes. I would advise those who are having trouble to give the machining special attention, as I have discovered that this is the chief difficulty. It is well to take a very light cut and I believe that many of the troubles will then disappear, as in taking heavy cuts the tool has a tendency to tear the metal instead of cutting it.

WALTER L. RUSSEL.

THE BUNCH RESIGNED.

P. Ault, foundry helper, and Frank Berry, pattern shop helper, are new men at the Western Gas Construction Co. this morning. L. Woods and Frank Boyle, foundry helpers, and J. Mercer, boilermaker helper, and C. Allspaugh, coremaker in the foundry, tendered their resignations.—Ft. Wayne, Ind., *News.*

COST OF EQUIPPING OPEN HEARTH STEEL FOUNDRIES

Estimated Expenditure Per Ton of Capacity—Basic Practice Recommended

Profitable Department for Gray Iron Plants

By W. M. Carr

OWING to the widespread interest manifested in the erection of steel casting plants there is considerable speculation as to the cost of their equipment. The following estimate is made on the basis of daily capacity of sound and salable castings. The calculations are based on the cost per ton of furnace capacity:

Furnaces only	$1,200
Gas producers and gas mains, or oil storage tanks and accessories	600
Buildings, 800 square feet of floor space per ton, at $1.25 per foot	1,000
Power, machinery, cranes, hoists, molding machines, tools, drying ovens, etc.	2,300
Total cost per ton	$5,100

These figures are based on a plant having an estimated capacity of 150 to 160 tons per day, or 4,000 tons monthly, with an equipment of five open-hearth furnaces costing approximately $750,000. A single open-hearth furnace lined for acid melting costs very nearly $1,000 per ton capacity. One for basic melting costs $1,200 per ton of output. These figures cover excavation, brick work, castings and structural material, including stack, but do not cover the platform or facilities for charging.

The average capacity of a furnace for open-hearth steel casting work is 20 tons. The number of furnaces in operation in a given shop with two or more furnaces will vary according to the demand. When castings are the only product, at least one furnace should be kept in reserve, pending repairs or a shut-down in the active furnaces. This will equalize deliveries and production. Gray iron foundries using steel castings will undoubtedly find it profitable to install an open-hearth furnace which should be of a size that can conveniently fit in with the existing equipment for handling ladles of hot metal. The writer would recommend a basic lining, since it permits the purchase of cheap iron and almost any kind of steel scrap. The basic process has reached such a stage of development that any foundryman of intelligence can successfully acquire the skill for its profitable operation. Modern foundry chemistry is fatal to mysterious information. There are no secrets or esoteric systems known only to the few. The principles of basic practice are an open book.

With a basic furnace in an active gray iron foundry of anything like a modern character, it would be perfectly feasible to manufacture steel castings in moderate, profitable quantities in conjunction with the regular product. About the only change necessary in the molding end of the practice would be a supply of silica sand and a sand mill to prepare the molding mixtures. A furnace of convenient size would have a capacity of 5 tons per heat. Such a furnace could easily produce four heats in 24 hours and could be depended upon to regularly make at least three, and if desired, only one heat per day. In the meantime, however, there would be a steady consumption of fuel to keep the furnace hot. The fuel should be either natural gas

or fuel oil. Producer fuel is often uncertain, irregular in composition, and requires additional labor for attendance and maintenance.

A 5-ton basic open-hearth furnace would cost approximately $6,000, if erected in a modern active iron foundry. As an additional outlay to cover bottom pour ladles, furnace platform, oil storage tanks, pumps, oil piping, burners, etc., a liberal figure would be $4,000, making a total expenditure of $10,000, not including, however, the buildings.

Charging five tons per heat, consisting of 50 per cent pig iron and 50 per cent scrap, there should be produced under normal practice, 12¾ tons daily at the rate of three heats in 24 hours. The loss or shrinkage is estimated at 15 per cent, which includes the melting loss, gates, risers, sculls and defective castings. The melting loss in the furnace is, on the average, seven per cent. This low loss is an important economical factor.

With a normal demand for castings, an average profit of ½ cent per pound could be expected, or $10 per net ton of product, which would be equivalent to $127.50 per day. There would be times when the furnace would be out of commission for repairs, periods which should not exceed one month at the most, but under ordinary conditions two weeks should cover general overhauling. With proper care, a basic furnace is capable of producing 400 heats before undergoing general repairs, or a campaign of 133 working days; in round numbers, four months. Assuming the active period for production would only be nine months in the year at the rate of 25 working days per month, there would be a productive period of 225 working days. At the rate of 12¾ tons per day or a yearly total of 2,868¾ tons at $10 per ton, the plant would yield a profit of $28,687.-50, figures which look attractive from a promoter's view point and might be vivid to embody in a prospectus. But, there would be times when the yield would shrink considerably, owing to errors in practice, breakdowns, delays and other detractive conditions, which would seriously decrease the difference between manufacturing costs and selling prices. As an extreme case, it will be assumed that the yield over metal charged was only 50 per cent good castings for the entire productive period as estimated; that the average profit was decreased to ⅛ cent per pound and that the tonnage was only 7½ tons daily or 1,687½ tons yearly. The profit then would be $4,218.-75, and charging off 25 per cent for interest, replacements, depreciation, etc., there would be a net return of $3,164,-.07 on an investment of $10,000 for a five-ton furnace in an active iron foundry. This would be equivalent to a profit of 31 6-10 per cent on the outlay, which, in view of the extremely unfavorable conditions considered in the estimating, makes a steel foundry as profitable as any foundry enterprise.

An open-hearth steel foundry, with intelligent practice and normal times or demand, offers an attractive venture to the investor and no doubt will receive the attention of gray iron founders who are interested in steel casting manufacture.

PERSONAL.

E. W. Cadwell has resigned as superintendent of the plant of the Peerless Foundry Co., Hamilton, O., and has returned to Cincinnati.

E. M. McIlvain, formerly president of the Bethlehem Steel Co., Bethlehem, Pa., has been elected president and general manager of the Robins Conveying Belt Co., Park Row building, New York.

E. H. Schwartz, until recently with the Standard Roller Bearing Co., Philadelphia, has accepted the position of metallurgical engineer of the Hawley Down Draft Furnace Co., Chicago.

Chas. M. Reubens has severed his connection with the Brady Brass Co., Jersey City, and has been admitted as a member of the firm of S. Reubens & Bro., dealers in metals, 68 Cliff street, New York.

Philip C. Tenant, who for a number of years was connected with foundry facing manufacturers in the east, has accepted the position of superintendent of the facing mill operated by Frederic B. Stevens, Detroit.

S. A. Watson has resigned as manager of the plant of the American Steel Foundries, Chester, Pa.

W. T. Archer is now manager of the Sheffield Cast Iron Pipe & Foundry Co., Sheffield, Ala., succeeding John Maitland, who had been acting manager since the death of John Thompson.

A. Tropenas, whose name is connected with one of the steel making processes employing the small converter, will arrive in the United States from France in the early part of May. His address while in this coutnry will be care of Powell & Colne, 11 Broadway, New York.

A. S. Blagden, heretofore in charge of the National Steel Foundry Co.'s plant at New Haven, Conn., has been appointed manager of the Chester, Pa., plant of the American Steel Foundries.

J. W. Eastabrook has been made foreman of the foundry and machine shops of Sixby & Grumme, Portland, Ind.

L. W. Lukens has resigned his position as foreman of the Keystone plant of the International Harvester Co., Sterling, Ill., and will return to Chicago.

Frederick F. Fuessenich has been elected president of the Hendey Machine Co., Torrington, Conn., to succeed the late Henry J. Hendey. He also retains the position of treasurer, which he has held for some time. Frederick N. McKenzie was chosen secretary to succeed Charles H. Alford, who was made vice president and general manager.

W. J. Dolan, recently connected with L. P. Smith Bros., Syracuse, N. Y., has accepted a position in the sales department of the Dayton Pneumatic Tool Co., Dayton, with headquarters at Pittsburg.

John H. Fecker has been appointed superintendent and manager of the foundry of the Favorite Stove & Range Co., Piqua, O.

TRADE PUBLICATIONS.

PATTERN SHOP AND FOUNDRY SUPPLIES.—Shanafelt Mfg. Co., Canton, O. Sixteen page catalog, 4 x 9 inches. Describes the complete line of leather and wood fillets, letters and figures, rapping plates, lifting screws, fillet tools, dowel pins and plates, pinch dogs, steel cement and chaplets manufactured by this company. The pattern letters and figures are made in many different designs and are adapted for the varying requirements of foundrymen and patternmakers.

METAL CLEANER.—Foundry Specialty Co., Cincinnati. Eight page booklet. The merits of the universal metal cleaner manufactured by this company, styled "Fluxine" and described in the March FOUNDRY, are set forth in this booklet. This cleaner is designed to replace the brass foundry fluxes generally in use, as it is claimed that it prevents oxidation and owing to its low melting point effects a great saving in metal.

CHEMICAL ANALYSES.—Kessler & Wiedemann, St. Louis. Sixteen page pamphlet. This firm of analytical chemists calls attention to the many advantages to be derived from the mixture of iron by analysis and in support of its claims reproduces an article from the Transactions of the American Institute of Mining Engineers.

CORE COMPOUND.—Frank L. Young & Kimball, Boston. Four page folder. Describes the merits of "Perfecto" liquid core compound manufactured by this company, which is claimed to have excellent binding properties, is free from gases, produces easy peeling cores and prevents the scabbing of castings. Directions for the use of this compound are also given.

THERMIT WELDING.—The Goldschmidt Thermit Co., New York. Sixteen page brochure, 9 x 11½ inches. Contains reports of welding frames, stern-posts, propeller shafts, etc., on steam ships and gives numerous illustrations of these operations. The adaptability of this process for making railroad repairs is also shown, with reports and numerous illustrations of successful welding.

SAND BLAST.—Vogel & Shemmann, Kabel, Germany. Twelve page pamphlet. Describes the sand blast equipment manufactured by this company.

GENERATING SETS.—B. F. Sturtevant Co., Boston, Mass. Bulletin No. 143, 8 pages. Contains a description of the generating sets manufactured by this company, equipped with horizontal engines. This issue completes the group of publications in its engineering series relating to engines and generating sets. This series comprises one bulletin each, covering the following subjects: Vertical enclosed engines, horizontal center crank engines, vertical compound enclosed engines, and one bulletin each describing generating sets equipped respectively with each of the above types of engines.

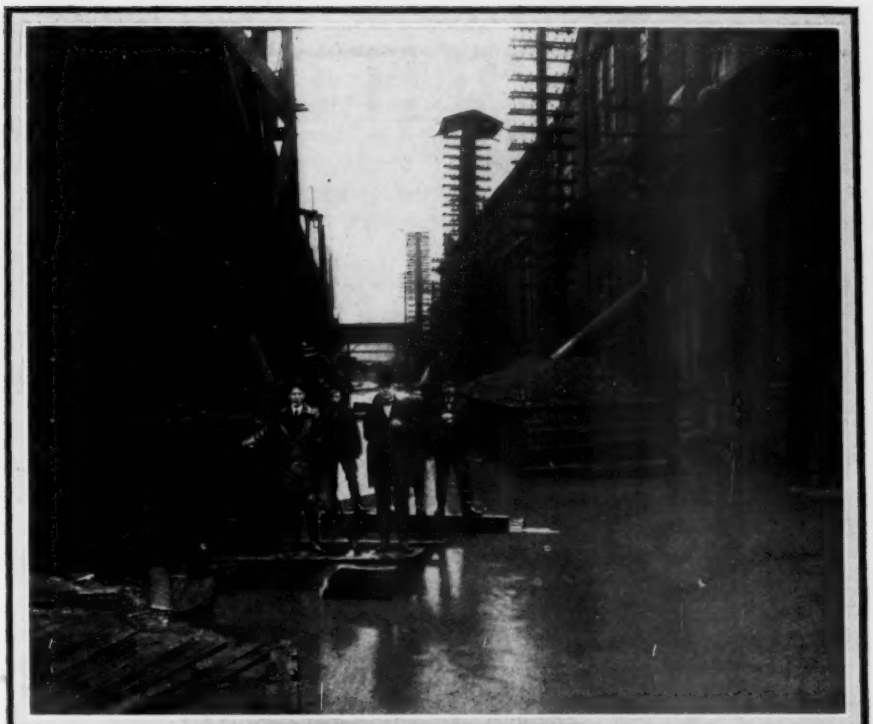
HIGH WATER IN THE OHIO VALLEY

PRECAUTIONARY measures to minimize the ravages of high water which must be contended with every year by the foundries in the Pittsburg district, and in fact throughout the entire Ohio valley, were of no avail during the February flood, whose high stage set a new mark. The damage to electrical machinery was unusually heavy and other losses were much greater than in former years.

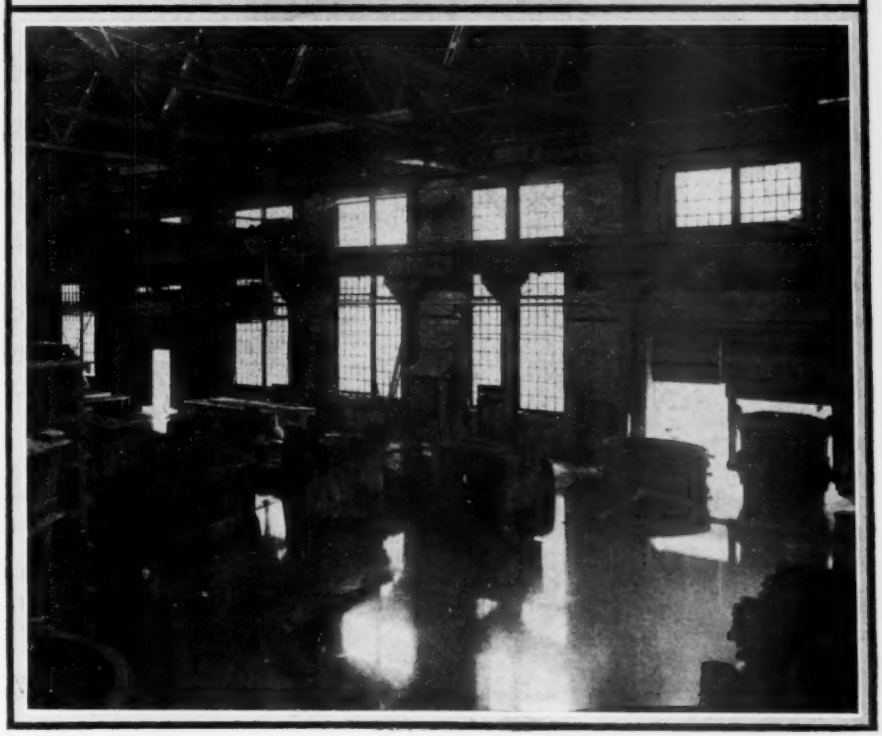
The accompanying illustrations show the conditions at the plant of Mackintosh, Hemphill & Co., Pittsburg, at a time when the water was rapidly receding, the high mark having been three feet above the stage shown. At the crest of the flood the steel foundry floor was six feet under water and in the machine shop all of the equipment was entirely submerged. Following the period of heavy rains the rivers rose so quickly and to such an unprecedented height that there was not sufficient time to elevate the lighter machines before the power was cut off. Steam was maintained until the last possible moment, the firemen working up to their waists in water before the grates under the boilers were submerged.

In the gray iron and steel foundries, finished molds, and castings which had just been poured, were piled on blocks before the water could reach them, while wooden flasks were lashed and fastened to the building to keep them from being washed away. Upon receipt of the first reports of impending high water the gas in the open-hearth furnaces was turned off to give them sufficient time to cool before the water reached them. Notwithstanding these precautions, they were flooded in a heated conditon and severely damaged.

A new open-hearth furnace recently completed, which is built inside of a riveted steel and concrete tank, placed above the previous high water mark, was flooded and will be partially rebuilt before it can be operated. As a result of experiences with many floods in the past, the company has built pits in the foundries, of steel and concrete construction, which are water-tight and of a sufficient height above the floor to be reasonably safe from high water. At the time of the rise practically all of these pits contained large and intricate molds ready to be poured. In the iron foundry one pit contained a mold for a 70-ton bed plate, in which the cores had just been set. These were quickly



ANCHORING THE PIG IRON



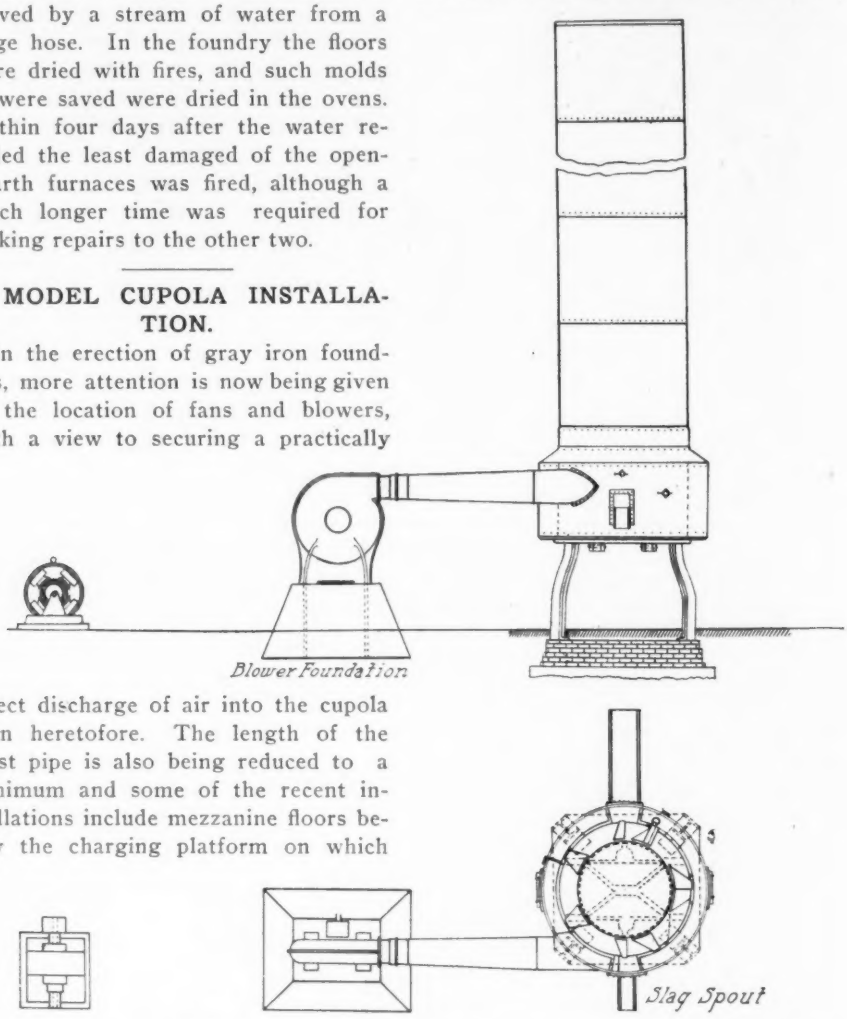
STEEL FOUNDRY—SPAR DECK AWASH

lifted out, but the drag part of the mold was ruined. Molds for a table for an 880-ton press and a 60-ton housing suffered a similar fate.

When the water receded the equipment in the entire plant was covered with a deposit of mud two to three inches thick. Most of this was removed by a stream of water from a large hose. In the foundry the floors were dried with fires, and such molds as were saved were dried in the ovens. Within four days after the water receded the least damaged of the open-hearth furnaces was fired, although a much longer time was required for making repairs to the other two.

A MODEL CUPOLA INSTALLATION.

In the erection of gray iron foundries, more attention is now being given to the location of fans and blowers, with a view to securing a practically direct discharge of air into the cupola than heretofore. The length of the blast pipe is also being reduced to a minimum and some of the recent installations include mezzanine floors below the charging platform on which the blowers, motors and controllers are placed.



ARRANGEMENT OF BLOWER AND CUPOLA IN THE NEW FOUNDRY OF THE HOME STOVE WORKS

The Home Stove Works, Chicago, has recently added another foundry and while the space for an ideal arrangement of blower and cupola was limited inside the plant, the blower and motor were located in a small structure erected in the foundry yard. The blower foundations were raised to a height of 2 feet, 9⅞ inches above the ground level, which provided for a direct discharge into the cupola. The blast pipe has a length of only 6 feet from the gate to the cupola and enters the latter at a tangent, as shown in the accompanying illustration. The cupola, which is a standard No. 7 Whiting, has a shell diameter of 72 inches, is 54 inches inside, has an air chamber 94 inches in diameter and is 55 feet high. The blower is a No. 8 special Sturtevant and is motor-driven as indicated. This equipment was furnished complete by the S. Obermayer Co., Chicago.

THE PATTERN SHOP

A DOUBLE CHUTE HOPPER PATTERN

Construction of Core Boxes—Method of Molding

By H. J. McCaslin

HOPPERS can assume most any form, as they are desired to meet varying conditions and requirements. Fig. 1 illustrates three views of the casting to be made, which is of conical form and has two rectangular outlets to which are riveted the sheet metal chutes. At the top of the illustration is shown a plan of the hopper as it would appear looking down into it. It will be seen that the center lines of the two openings are not in the same plane, but in the plane of the radial lines A B and B C. To the right is shown a cross section of the hopper on the line D D, showing the metal distribution, which is about one inch in thickness throughout the hopper. Shown at the bottom of the illustration are two radial sections on the center lines A B and B C of the chute outlets, the form of the chute openings also being shown.

In making any pattern, the method of molding must first be determined. Owing to the difficulty sometimes experienced in imagining the object to be made in its material form, the question of the most practical and economical manner of procedure often arises. For this reason the making of a rough model of the exterior form of the object will be found very helpful. The model will show the best method for molding the pattern, which of course will determine its construction. This extra work may appear as a needless expense, but the cost will be negligible as compared with the advantages secured.

Rough Model of Hopper.

To make a rough model of the hopper to the scale of 1½ inches to the foot, the time required should not exceed three hours, as most of the work can be done on a lathe, the only bench work required being the laying off and the sawing of the chute connections to form. If a joint is made along the radial lines A B and B C, Fig. 1, when preparing and turning out the block from which this portion of the model is to be made, a decided advantage will be gained, as it will facilitate the laying out and sawing of the piece. While the pattern could be made and arranged that the molding could be done entirely in green sand, it would hardly be practical. The method discussed in this article may, therefore, be employed with very good results. A green sand core is used to form the interior of the hopper, and a dry sand core for the interior of the chute connections.

Arrangement of Mold.

Before discussing the construction of the pattern and core box, we can obtain a better idea of the method of molding by studying the arrangement of mold as shown in Figs. 2 and 3. These two illustrations are cross sections of the completed mold on the center lines A B, B C and D D, Fig. 1, and show the features of molding that govern the construction of the pattern, including the method of starting and checking off. From the arrangment of the mold, the pattern will be in two parts, as shown in Fig. 4, which is an inverted plan of the assembled pattern. The figure also shows two radial sections on the

lines to H and H I through the center of the chute connections.

Building the Pattern.

In building the pattern the conical portion of the hopper is first considered. This part of the pattern is built up of segments and turned in the usual way. To facilitate the turning and to aid in securing in place the chute connections of the pattern, that portion of the hopper which is enclosed by the material forming the chute connections is cylindrical, as shown in Figs. 4 and 5. As the facilities for turning deep work are not very good in most pattern shops, the interior of such patterns should be turned as the building of the segments progresses. When three or four courses of segments have been built, this portion of the inside surface is turned to the exact size, and segments are added and turned until the work has reached the required height.

When the inside has reached this stage of completion, material to form the interior flange Z is procured, fitted and secured in place with screws and turned to form. Before removing the screws, holes should be bored for loose dowel pins, as the series of segments forming this flange must be attached in this way to allow their removal from the sand.

Chute Connections.

The exterior surface of the pattern having been turned, the work is removed from the lathe and the laying out on the center lines G H and H I of the chute connections, as shown at the right in Fig. 5, is taken up. This illustration shows two views of the

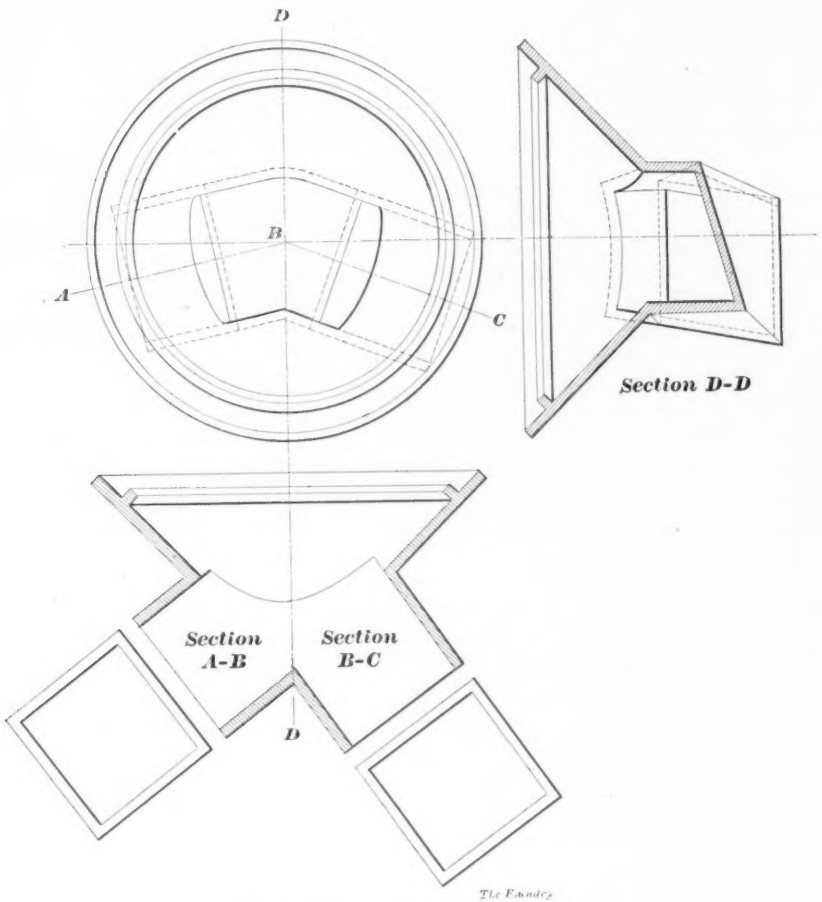
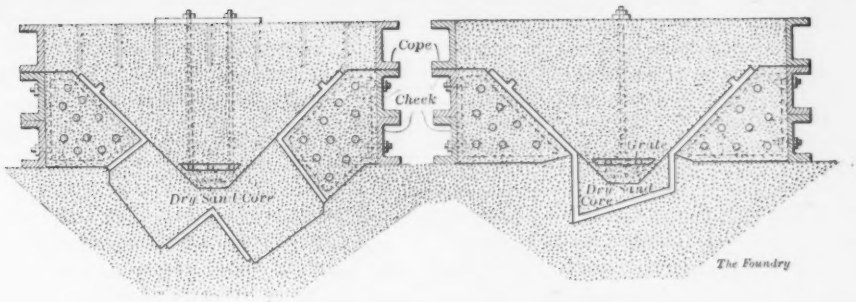


FIG. 1—THREE VIEWS OF HOPPER



FIGS. 2 AND 3—ARRANGEMENT OF MOLD

chute connections during the first stage of construction, and also at its completion. Owing to the position and form of the chute connections, it would be difficult to construct them in position without a fixed surface to build to. For this reason the depression Y, Fig. 5, having a depth of about one inch, is cut down into this surface, to receive and locate the two pieces of material W and X in the plane of the center lines G H and H I of the chutes as shown. These two pieces of material W and X, having been made of ample size to allow for sawing and dressing to form, are fitted into their correct positions, and temporarily secured with screws inserted from the inside of the hopper.

As the two pieces of material, W and X, lie in the same plane as the center lines or radial sections, A B and B C, shown in Fig. 1, it is a simple operation to lay off the outline of the chutes upon this material. The work at this stage of completion is shown at the right of Fig. 5. At the left in this figure are shown the chute connections or that portion of the pattern as it would appear when completed, being shown in the reverse position to that in which it was built.

Core Box Construction.

Illustrated in Fig. 6 are plan and sectional views on the lines E F and F G of the core box employed in forming the dry sand core. This core is used to form the interior of the chute connections, as shown in the two cross sections of the completed mold, Figs. 2 and 3. The core is made in the reverse position to that shown in the mold, in order to facilitate the box construction, and also to avoid a roll over of the dried core prior to placing it in the mold. The core box is what might be termed a combination arrangement, having a frame attached for filling in green sand to form a surface with which to support the core while drying. This is necessary when a core must be dried upon an irregular surface. The box consists of a rectangular frame with bottom board, upon which is laid off a plan of the chute connections shown

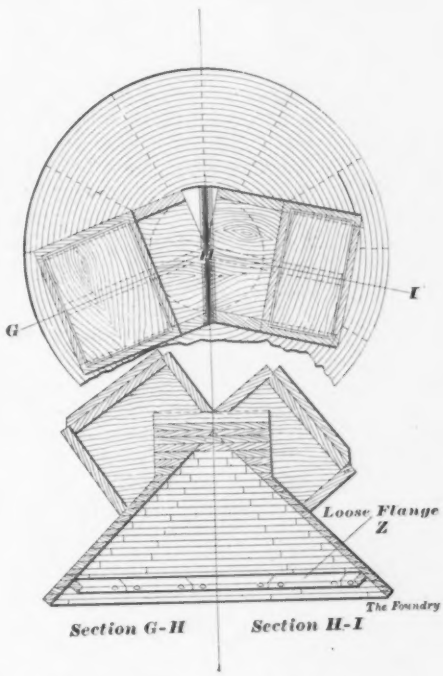


FIG. 4—TWO PARTS OF PATTERN

in Fig. 6. At the top of the illustration is the core box as it would appear looking down into it, while at the bottom is shown a section on the lines E F and F G. A cone, shown at R, Fig. 6, having been built and its exterior surface turned to conform to the interior dimensions of the hopper, Fig. 4, its fustrum is cut away to allow the material V to pass it, in which position the cone is secured to the bottom board. With the material V made to the required form and fastened to the sides of the frame, it is a simple operation to fill in the material S and T, which is placed in loose. To prevent the sand from falling down between the material V and the sides of the frame, the openings are closed, as shown in dotted lines.

The bottom board is then removed, the frame loosened and lifted off, and the loose pieces removed from the core. Following the usual application of the trowel and core wash it is introduced in the oven and dried.

Molding the Pattern.

Omitting a description of the molding in detail, we will discuss only the principle features bearing upon the arrangement of the mold, as shown in Figs. 2 and 3. In beginning the mold the chute portion of the pattern is bedded in the floor and leveled, and the sand firmly tucked and rammed about it. The irregular parting is then made about the pattern, which is followed by the placing in position and staking of the cheek flask. Provisions in the form of bars or wings are made

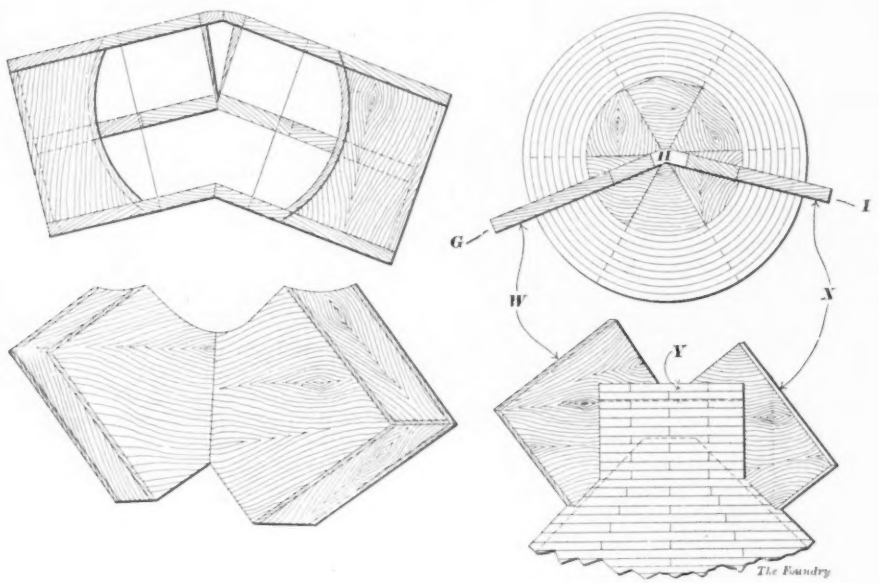


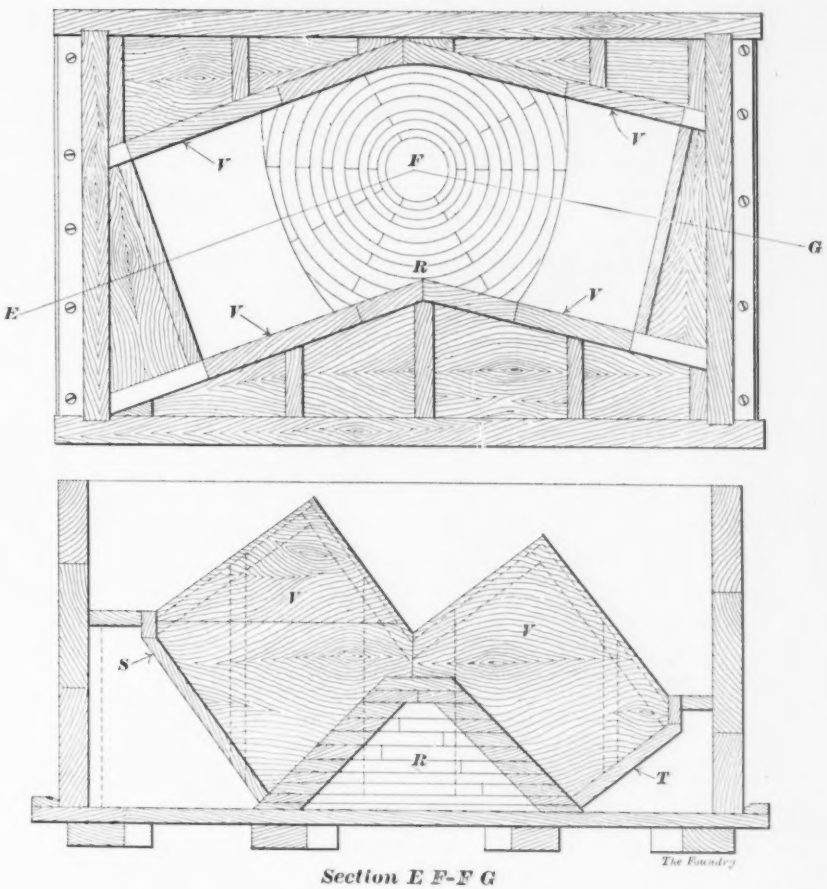
FIG. 5—CHUTE CONNECTIONS AND PATTERNS IN CONSTRUCTION

Making the Core.

When the ramming up of the core has reached the height of the material V it is struck off to conform to this irregular outline, and this is followed by filling in green sand to form a drying surface for the core. The next operation consists of clamping on the core plate and rolling over the box.

in the cheek flask to secure this body of sand. The hopper portion of the pattern is placed in position and the cheek is then rammed. At the completion of this portion of the mold a joint is struck off. Attention is next given to the manner of anchoring and ramming of the conical green sand core, which forms the interior of this

portion of the casting. Shown at P in Figs. 2 and 3 is the anchor or grate used in lifting out this body of sand, which is provided with bolts or rods which extend through the cope flask. The anchor having been placed near the bottom of the pattern, sand is rammed through and around it, and is followed by the ramming and rodding of the core to the top of the pattern. The cope is then placed on and rammed in the ordinary manner. With the aid of the anchor rods the core and cope are securely bolted together, and lifted off. The hopper portion of the pattern is then drawn, which permits the cheek of mold to be lifted off. The chute portion of pattern is then exposed and is free to be drawn. The segments forming the loose flange Z in the green sand core having been removed the various parts of the mold receive the usual dressing and the dry sand core is set. In assembling the mold the cheek guided by the stakes, is returned to its proper position; the cope is placed upon it and the metal thickness tried. If found correct, the mold is prepared to receive the metal.



Section E F-F G

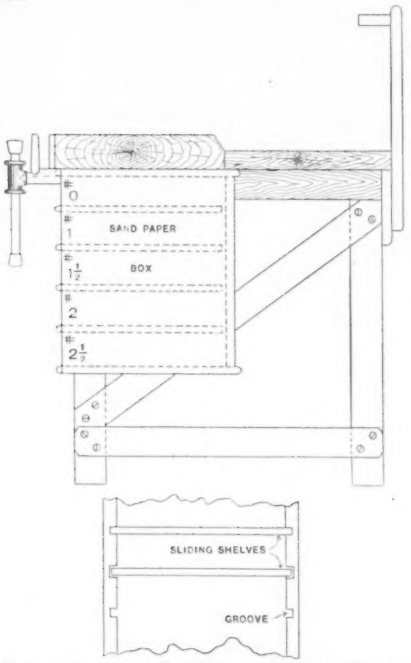
FIG. 6—PLAN AND SECTION OF CORE BOX

PATTERN SHOP WRINKLES

Convenient Sand Paper Holder and Bench—Filleting Irons

By Patternmaker

IT IS disgusting to a neat patternmaker to work at a bench in which there is a drawer that is filled with all kinds of trash that is not wanted, and mixed in with this trash there are screws, nails, brads, tacks, pattern letters, short pieces of dowel pins, leather fillets, sand paper, etc.

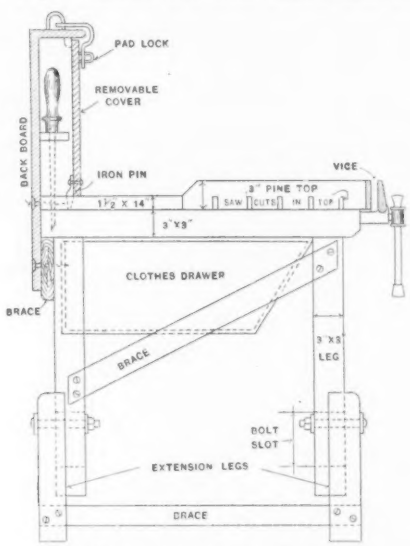


Figs. 1 and 2—Sand Paper Holder

All grades of sand paper are mixed together and in such shape that it is not fit to use. In the machine shop the foreman or proprietor makes an effort to have a handy place for drills, taps and dies, machine tools, etc., but in the pattern shop little attention is given to detail.

In Fig. 1 is shown a sketch of a neat sand paper holder that I saw in a carpenter shop. It is an ordinary box that any apprentice boy can make. It has a top, bottom, sides, and back, with open front. The height is governed by the number of sliding shelves wanted and the width and depth is one-quarter inch wider and longer than a sheet of ordinary sand paper. The sides are grooved, Fig. 2, to receive sliding shelves, which are about one inch apart. Each grade of sand paper is placed on a shelf as in Fig. 2, and secured to the shelf with brads or tacks at the back on each corner. When a small piece is wanted, draw out the grade, place a straight edge, or any convenient piece on top, and tear off just what is required.

Fig. 2 shows the box under, and secured to bench at the opposite end to the vise. It is a handy place and is always a part of the outfit of the bench.



Patternmaker's Bench.

PATTERNMAKER'S BENCH.

In the January issue of The Foundry there appeared an article by Mr. Leon on "The Relation Between the Molder and the Patternmaker." He draws attention to the clean pattern shop and all the nice, convenient wardrobes, toilet outfits, etc., it contains.

In the past 30 years I have worked in a number of shops and the majority of them were far from being the rosy places painted by Mr. Leon. However, I am

pleased to note that the modern manufacturer is giving a little attention to the pattern shop and considering the output of the pattern department in the profits, and not in the loss column of the ledger.

Illustrated herewith is an end view of a patternmaker's bench that I saw in a shop while visiting in New Orleans. It is a model of convenience and costs little more to make than the ordinary traps.

Note the heavy top with saw cuts in the bottom to prevent warping, the adjustable legs that can be adjusted in five minutes to "fit" the workman. It prevents camel back patternmakers. The clothes drawer under the bench is out of the way, clean, roomy and dust proof.

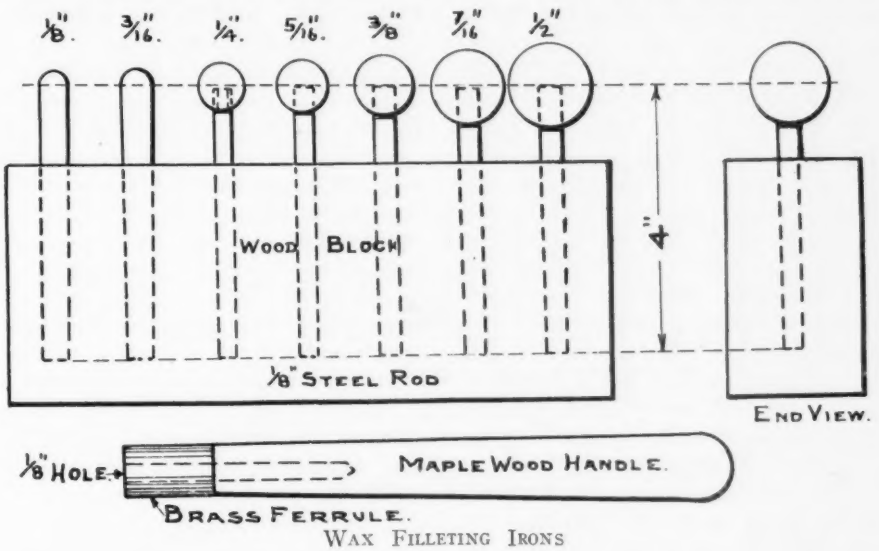
The tool rack, or box in the back, as shown in section, with removable cover, can be removed during working hours, and replaced at night and locked. This answers two purposes; it saves time and trouble in putting in and taking out tools from tool chest every day, and secures them against theft.

The tool rack can be made the full length of bench if desired, and as for the length and height of bench and dimensions of drawer, I prefer to leave that to the patternmaker's needs.

WAX FILLETING IRONS.

A set of patternmaker's wax filleting irons, with a handle for the same, is shown in the acompanying illustration. They are accurate in size, handy and compact, and can be easily carried in a tool chest.

They consist of an ordinary steel ball, with a steel rod ⅛ inch in diameter. The ball should be annealed sufficiently to make it soft, so that holes can be drilled for the rods, which are cut about 4 inches long or longer if desired. The holes for the rods should be drilled so that a snug fit can be had. The wooden handles can be made any length, with ferrules on the ends, with holes drilled to fit tightly over the rods to provide a firm grip and to have sufficient length if the tools are to be heated in warm water. The tools are inserted in a wooden block, as shown in the sketch.



WAX FILLETING IRONS

The ⅛-inch iron is a section of the rod having a round end and the 3-16 iron is made with its one end round, while the opposite end is tapered to fit the hole in the wooden handle. If fortunate enough to have a chuck that will hold a ⅛ inch drill, the tools can be made in the pattern shop on an ordinary lathe. If the ¼-inch ball is used, a hole 3-32-inch or 1-16-inch in diameter should be drilled and a shoulder pin should be turned on the end of the rod. This should be done owing to the size of the ball.

Philadelphia Convention of the A. F. A.

Interesting Program Outlined—Extensive Exhibits of Foundry and Pattern Shop Supplies and Equipment

ALTHOUGH the program of the proceedings of the convention of the American Foundrymen's Association has not been definitely adopted, it has been decided to open the exhibit in the Second Regiment Armory on the morning of May 20, when registration will begin. The opening session of the meeting will be held on Tuesday morning, and the address of welcome will be made by the Mayor of Philadelphia. Reports of the president, secretary and committees will also be submitted. Papers will be read during the afternoon session, while the evening has been left open for individual or official entertainment. On Wednesday morning, matters of interest to the brass trade will be discussed and the organization of a Brass Founders' Association will be effected. Papers illustrated with lantern slides will be presented in the afternoon and a smoker will be given by the Philadelphia association in the evening. A river trip and shad dinner has been arranged for Thursday, with visits to the Wm. Cramp & Sons Ship & Engine Building Co., and other ship yards. The closing sessions will be held on the return trip or immediately thereafter. Arrangements have been made for a trip to the Baldwin Locomotive Works and other large plants on Friday.

Among the papers promised are the following subjects: Cupola practice, use of mixer in the foundry, cost accounting, industrial betterment, technical schools in the foundry, pattern notes, foundry construction and lay out, core room practice, gray iron, the steel foundry as a business venture, blast furnace practice, malleable iron, cast thread fittings, skilled labor supply for foundries, dry galvanizing, electric smelting for the foundry, and brass and metallurgical problems.

FOUNDRY SUPPLY ASSOCIATION.

The annual meetings of the Foundry Supply Association and the Associated Foundry Foremen will be held in Philadelphia simultaneous with the convention of the American Foundrymen's Association, May 20 to 24. The record-breaking attendance of foundrymen from all sections of the country already promised will afford other organizations allied with the trade excellent opportunities of holding their periodic meetings at this time. A lively interest is also being manifested in the organization of the Brass Founders' Association, special invitations having been sent to all allied with this industry by C. J. Caley, vice president of the American Foundrymen's Association, urging them to attend.

At a meeting of the executive committee of the Foundry Supply Association held March 30 at the Hollenden hotel, Cleveland, president S. T. Johnston and secretary H. M. Lane reported the results of their recent trip to Philadelphia, where a meeting was held with E. H. Mumford and Howard Evans, members of the executive committee of this organization, and Dr. E. E. Brown, who represented the entertainment committee of the Philadelphia Foundrymen's Association. It was reported that the latter, through its committees, would attend to all the arrangements for entertainment in connection with the convention, but would leave the exposition feature to the

Foundry Supply Association. The sessions of the American Foundrymen's Association and the exhibits will be free, but the entertainment, which will consist of a shad dinner, river trip, smoker, etc., will be confined entirely to members of the American Foundrymen's Association, Foundry Supply Association, Associated Foundry Foremen, Philadelphia Foundrymen's Association, and visitors who will go to Philadelphia to join the Brass Founders' Association. Inasmuch as the members of the Foundry Supply Association are likewise enrolled in the American Foundrymen's Association, they will be entitled to two representatives each who can partake of all of the entertainment features. Firms associated with the Supply Association will be permitted to have additional representatives present, by the payment of $15 per person, which will include all of the privileges of the convention, including entertainment. Representatives or employes of firms who attend as clerks, demonstrators, etc., but do not partake of the entertainment, will not be considered as representatives and will not be registered in the regular attendance list.

The finances of the Foundry Supply Association were carefully considered, and from present indications there will be sufficient revenue from the rental of space to cover all of the expense of the exhibit. Music will be engaged to be in attendance at the armory throughout the gathering, provided the amount of space sold aggregates $2,450. Two tickets will be furnished each concern, which should be presented at the registration desk at the time the firm's representatives apply for registration to secure credentials for entertainment, etc. If the concern desires additional tickets, the secretary should be notified before the convention, to avoid confusion.

Every effort is being made to have the railings and signs for the booths as uniform as possible. The signs above the exhibits are to be confined to a height of 12 feet from the floor and the railing to a height of 34 inches from the floor. The width of the signs is limited to 30 inches. Up to the present time, 80 firms have been enrolled as members of the Foundry Supply Association and 60 have been allotted space. The question of revising the constitution was discussed at length, and it was finally decided to defer action until the Philadelphia meeting. Those in attendance included: S. T. Johnston, president; E. A. Kebler, second vice president; J. S. McCormick, treasurer; H. M. Lane, secretary; U. E. Kanavel, J. S. Smith and H. E. Mills, members of the executive committee.

Location of Exhibits.

A plan of the Second Regiment Armory, Philadelphia, with exhibitors' locations is shown in Fig. 1. The tent, which will be located in the vacant lot adjoining the convention hall, is shown in Fig. 2. It will be 150 feet long and approximately 50 feet wide, and will contain exhibits of large machines in operation. The following allotment of spaces is subject to revision and a few changes may be made before the convention:

No.	Firm.
1.	Registration Desk.
2.	Tabor Mfg. Co., Philadelphia.
3.	J. S. McCormick Co., Pittsburg.
4.	B. F Sturtevant Co., Boston.
5.	Thomas W. Pangborn Co., New York.
6.	Hanna Engineering Works, Chicago.
7.	Arcade Mfg. Co., Freeport, Ill.
8.	R. B. Seidel, Inc., Philadelphia.
9.	Diamond Clamp & Flask Co., Richmond, Ind.
10.	Edward J. Etting, Philadelphia.
11.	Killing Molding Machine Co., Davenport, Iowa.
12.	Detroit Foundry Supply Co., Detroit.
13.	Smyth, Swoboda & Co., New York.
14.	Kerr Turbine Co., Wellsville, N. Y.
15.	Primos Chemical Co., Primos, Delaware Co., Pa.
16.	Oliver Machinery Co., Grand Rapids, Mich.
17.	Cortland Corundum Wheel Co., Cortland, N. Y.
18.	Robeson Process Co., Camden, N. J.
19.	The Foundry, Cleveland.
20.	U. S. Graphite Co., Philadelphia.
21.	W. W. Lindsay, Philadelphia.
22.	Western Foundry Supply Co., East St. Louis, Ill.
23.	Link-Belt Engineering Co., Philadelphia.
24.	Cyrus Borgner, Philadelphia.
25.	Camden Coke Co., Camden, N. J.
26.	Chicago Pneumatic Tool Co., Chicago.
27.	Henry E. Pridmore, Chicago.
28.	Monarch Emery Wheel & Corundum Co.
29.	Foundry Specialty Co., Cincinnati.
30.	A. E. Hoermann, New York.
31.	Buffalo Forge Co., Buffalo.
32.	Stanley Doggett, New York.
33.	Pettinos Bros., Bethlehem, Pa.
34.	Goldschmidt Thermit Co., New York.
35.	S. Obermayer Co., Cincinnati.

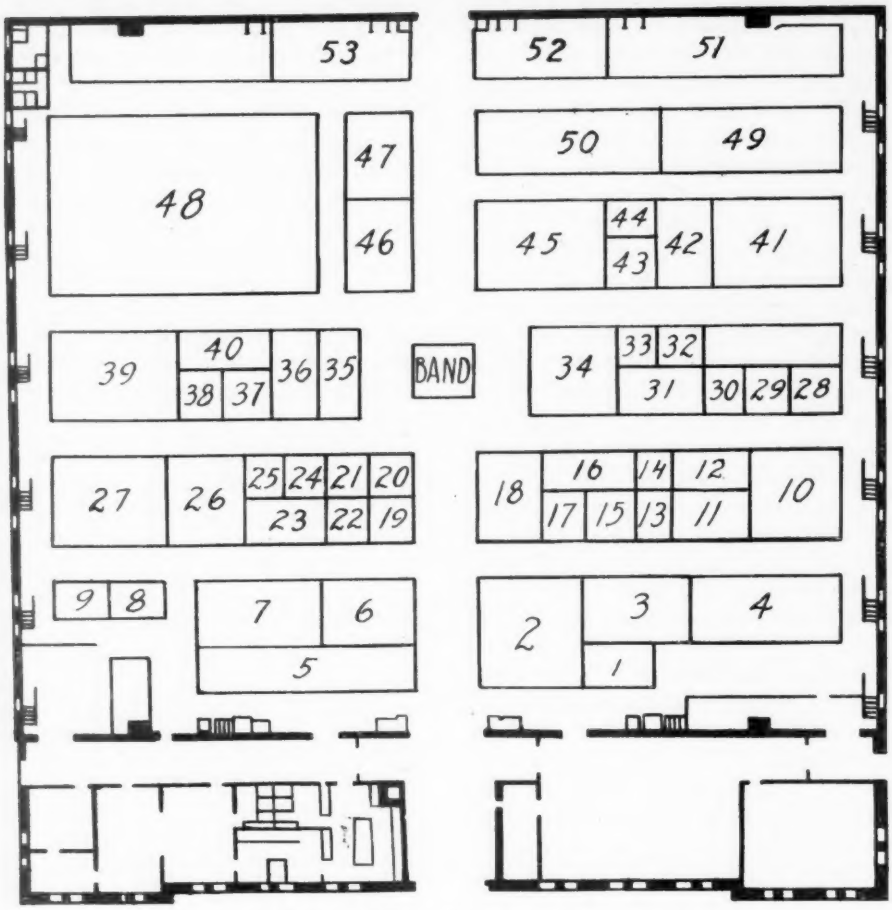


FIG. 1—PLAN OF THE ARMORY SHOWING SPACE ALLOTMENT

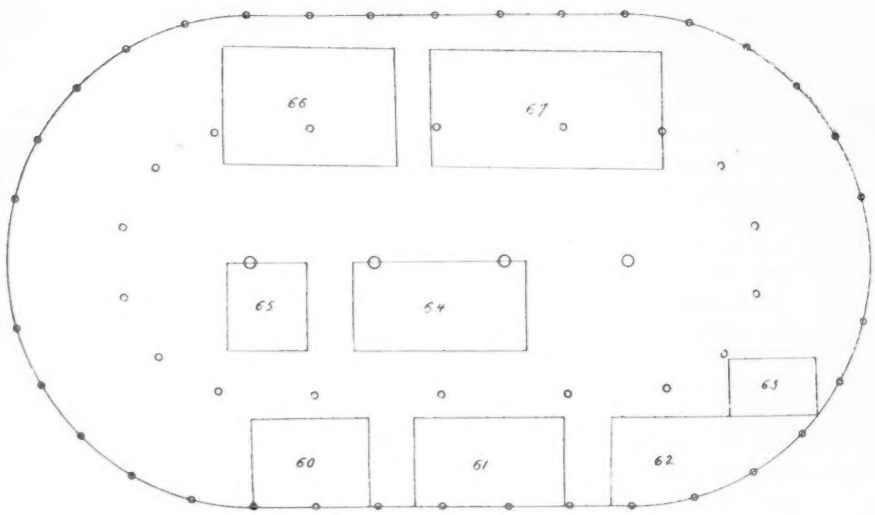


FIG. 2—PLAN OF THE TENT

36.—Whiting Foundry Equipment Co., Harvey, Ill.
37.—Southern Machinery.
38.—Edwin Harrington, Son & Co., Philadelphia.
39.—E. H. Mumford Co., Philadelphia.
40.—P. H. & F. M. Roots Co., Connersville, Ind.
41.—Joint exhibit by the W. W. Sly Mfg. Co., Cleveland; the New England Engineering Co., Boston, and the Northern Engineering Co., Detroit.
42.—C. E. Mills Oil Co., Syracuse, N. Y.
43.—Cleveland Wire Spring Co., Cleveland.
44.—Osborn Mfg. Co., Cleveland.
45.—C. Drucklieb, New York.
46.—Yale & Towne Mfg. Co., New York.
47.—Joint exhibit by the Interstate Sand Co., Cleveland, and the Garden City Sand Co., Chicago.
48.—Joint exhibit by the J. W. Paxson Co., and the Wilbraham-Green Blower Co., Philadelphia., and the Joseph Dixon Crucible Co., Jersey City, N. J.
49.—Berkshire Mfg. Co., Cleveland.
50.—J. D. Smith Foundry Supply Co., Cleveland.
51.—Falls Rivet & Machine Co., Cuyahoga Falls, O.
52.—Standard Sand & Machine Co., Cleveland.
53.—R. T. Randall & Co., Philadelphia.
60.—Rockwell Engineering Co., New York.
61.—Arthur Koppel Co., New York.
62.—Monarch Engineering & Mfg. Co., Baltimore.
63.—Holland Linseed Oil Co., Chicago.
64.—Joint exhibit by the Otto Gas Engine Works, Philadelphia; Crocker-Wheeler Co., Ampere, N. J.; and the Main Belting Co., Philadelphia. This exhibit will comprise the power plant for furnishing direct current to the exhibitors.
65.—Herman Pneumatic Machine Co., Zelienople, Pa.
66.—Mitchell-Parks Mfg. Co., St. Louis.
67.—Ph. Bonvillain & E. Ronceray Co., Paris.

FOUNDRY COST INVESTIGATION.

Kenneth Falconer, 224 St. James street, Montreal, Que., chairman of the American Foundrymen's Association's Committee on Costs, is sending a circular to the membership for data on the practice generally followed regarding foundry costs. The following questions are asked:

1. When making estimates for selling purposes do you figure on
   (a) Average cost per pound?
   (b) Cost of metal, core making and molding separately?
2. Do you
   (a) Regularly and continuously operate a system of foundry cost keeping?
   (b) Do you simply make up the cost of particular or occasional castings, or lots of castings?
3. Do you figure the cost of your foundry output
   (a) Weekly?
   (b) Monthly?
   (c) Yearly?
4. Do you pay for molding
   (a) By day wage?
   (b) By piece work?
   (c) By any other system than by day or piece work?
5. Do you pay for core making
   (a) By day wage?
   (b) By piece work?
   (c) By any other system than by day or piece work?
6. Is the time of molders
   (a) Kept by order numbers?
   (b) By themselves or by a time clerk?
7. Is the time of core makers
   (a) Kept by order numbers?
   (b) By themselves or by a time clerk?
8. On what basis do you distribute the cost of superintendence and other general items on the cost of castings?

The report of the committee will be presented at the Philadelphia convention of the association, May 20-24.

SULPHUR IN FUEL OILS.

The rapid increase in the use of oil for fuel has caused the consumer to investigate the quality of his product with more scrutiny than heretofore. Many persons have the impression that fuel oil is free from sulphur, and for this reason it is superior to coal for melting. This is not true, and not only does practically all of the fuel oil commerce contain more or less sulphur, but some of it is very high in this impurity. The Texas oils are particularly high in sulphur. We herewith append some analyses that were made of fuel oils:

Sample.	Per Cent Sulphur.	Source.
1.	4.98.....	Texas
2.	3.67.....	Texas
3.	2.01.....	Pennsylvania
4.	.63.....	Pennsylvania
5.	.25.....	Pennsylvania
6.	.60.....	Pennsylvania
7.	.19.....	Pennsylvania

For melting, an oil as low in sulphur as possible should be used. Sulphur causes blow-holes in the metal and increases the production of dross. A good grade of fuel oil should not run over 0.50 per cent of sulphur, if it is to be used for melting, and a less amount is better. —*Brass World.*

THE MAIN SPRING RESIGNED.

The foundry of the engine and thresher works was closed Wednesday, but is open again today. The cause of the shut-down was that Julius Richards, who has the contract for removing the molds at night so the men can work, resigned his position the day before and they could not get a man in time to work that night. —Pork Huron, Mich., *Herald.*

METALS IN FOUNDRY PRACTICE

Questions from Practical Foundrymen are answered in this department by the following experts:

CAST IRON . . . . . W. J. KEEP
MALLEABLE IRON . . DR. RICHARD MOLDENKE
METALLURGY OF STEEL . . . J. B. NAU
STEEL CASTINGS . . . . W. M. CARR

Other experts also contribute Address all inquiries to the Editor

CAST IRON NOTES

By W. J. Keep

Question.—Our mine car wheels crack in the spokes. Our heavy castings sink considerably and the larger the head the more they shrink. An analysis of a good wheel made some time ago showed silicon 2.40 per cent, phosphorus 0.65 per cent and sulphur 0.03 per cent.

Our scrap consists chiefly of mine car wheels. When the blast is put on we often notice a strong odor of sulphur and yet they tell us our coke is of good quality.

Answer.—If you should get an analysis of the wheels that crack or of the castings that shrink you would find that the silicon was less than 2.40 per cent or that the sulphur was higher than 0.03 per cent. It is very difficult to keep sulphur below 0.06 per cent, and the practical way is to increase silicon until the trouble stops. This you do by using more soft pig iron or else less scrap.

Your coke must be good or you would not get such a low sulphur content. Fluorspar is an excellent flux and it is added to the fuel in the cupola in the proportion of about 5 pounds to the ton of iron melted.

PICKLING CASTINGS.

Question.—What are the proper proportions of vitriol and water to be used in pickling gray iron castings and what is the best way to use the same? Why do these castings pickle more easily in summer than in winter and is it advisable to have the pickling room heated?

Answer.—Vary the strength to suit the conditions. Do not allow the surface to be injured. Try one part vitriol to five parts of water, if the castings are to be left in over night. For large castings apply a much stronger pickle with a cloth attached to a stick or an old broom. The higher the temperature the faster the work will be done. Live steam may be introduced by a pipe to heat the pickle.

CASTING THREADS IN CASTINGS.

Question.—Is it practical to cast successfully a one inch standard pipe bushing in a piece of iron and after the iron has solidified to unthread the bushing and have a statisfactory thread in casting and bushing. If not how can it be cast?

Answer.—The only way to do this successfully is to use the tin threads made by Burdick & Son, Albany, N. Y.

ANNEALING GRAY IRON CASTINGS.

Question.—We have considerable trouble annealing our gray iron castings and occasionally we have a run of castings that are extra hard which have a white streak in them and which we find difficult to anneal in the regular Brown & Sharpe kiln, packed in sand. What is the best method for removing this white streak?

Answer.—Sand is as good a packing as any for annealing and any gray casting, however hard, can be annealed soft

by heating to a white heat and allowed to cool slowly. This must be done while packed in a pot in sand or charcoal powder. It cannot be done by heating in a forge fire. I do not believe you can change the white streak to gray. It takes a very high temperature and very slow cooling to turn any white iron gray.

The white streak with the exterior gray occurs with quite high silicon and the cause has been described very often in these notes.

The total carbon, the silicon, and manganese will not be varied by annealing. The sulphur and phosphorus may be slightly increased.

The annealing changes the combined carbon into graphite.

The following are the analyses of a casting before and after annealing. The casting was packed in wood shavings and heated to a white heat in 12 hours and then cooled in another 12 hours.

	T C	G C	C C	Si	P	S	Mn
Before, per cent	3.77	3.32	0.45	1.78	0.505	0.041	0.568
After, per cent	3.77	3.68	0.05	1.78	0.510	0.043	0.568

The object in annealing castings is to get very soft castings with low silicon and therefore a very close grain with great strength.

The white streak with gray exterior only occurs when the silicon is rather high as in a stove casting. The sulphur is always high in stove castings, because of the large proportions of gates that are melted over each day. Such castings are made somewhat softer by annealing but are not changed as much as castings with low silicon.

ANALYSIS OF STOVE CASTINGS.

Question.—What do you consider the best analysis for a stone mixture before charging?

Answer.—The following is the analysis before charging and of the resulting stove casting:

	Total Carbon.	Silicon.	Phosphorus.	Sulphur.	Manganese.
Mixture, per cent	3.40	3.10	0.80	0.06	0.71
Casting, per cent	3.33	2.80	0.80	0.09	0.60

These proportions can vary considerably and still make good castings. In stove plate the silicon should be near 3.00 per cent and the phosphorus about 1.00 per cent. Sulphur will run about 0.09 per cent and manganese should be about 0.5 per cent.

USE OF STEEL SCRAP.

It has been my contention that steel scrap in the form of sheet clippings does not increase the strength of cast iron. It hardens iron and gives it a very close grain and is essential for such castings as steam and hydraulic cylinders, as it closes the pores in the metal and so adds to its wearing quality. From experience I have found that with a 15 per cent charge of steel in a very hot cupola the metal is soft enough for almost any purpose, while on the other hand, with the same charge in an ordinary cupola the metal is very hard and the castings are machined with difficulty. For this reason I contend that the steel scrap burns out with extreme heat. I believe that it can be used profitably for chilling castings of an insignificant nature as almost any required chill can be obtained by its use and at the same time the scrap can be reduced. As a paying proposition, however, I do not see that the practice can be pursued to advantage, although I would like to hear from other foundrymen on this subject.

H. Cov. Va.

REQUEST FOR AN OIL BURNER.

I would like to receive a rough sketch of an oil burner as I am endeavoring to adopt a set of three coke furnaces for melting brass to fuel oil. The furnaces are of the tilting type, the crucible remaining in the furnace. The available power for atomizing the oil is steam at 100 pounds pressure per sq. in., or centrifugal blast at 12 ounces. Compressed air is out of the question.

R. S.

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The A. F. A. Convention

From present indications, the approaching convention of the American Foundrymen's Association will be one of the memorable events in the history of this organization. The success of the exhibition feature, which is being conducted by the Foundry Supply Association, is already assured, sixty manufacturers of foundry and pattern shop equipment and supplies having reserved space in the armory and the tent which will be erected in the adjoining lot for power machines in operation. Through the untiring efforts of Dr. Richard Moldenke, a program has been outlined, replete with live topics touching every phase of the foundry industry. The ensuing discussions will be of immeasurable value not only to foundry proprietors, but to superintendents, foremen, journeymen and apprentices as well. The entertainment will also be on an elaborate scale and will reflect the unbounded hospitality for which the hosts of the Quaker city are noted. Every progressive foundryman should attend and should insist on the presence of each of his department heads. One large eastern manufacturer has decided to send 14 superintendents and foremen and another in the west will be represented by six. All expenses will be defrayed by these concerns, the cost of the trip being considered a profitable investment. The requirements of the foundry trade are daily growing more severe and as the solutions of the many problems which confront the melters are usually dependent upon the ingenuity of the department executives, they should be given opportunities to acquaint themselves with the most modern practice. The displays will likewise prove interesting, as many builders are preparing to show tools never offered to the trade before. The papers which will be read are being prepared by experts in their respective fields and will be replete with new practices that can be adopted with profit by many plants. The most progressive founders insist upon peri-

odic visits by their foremen and superintendents to other shops for the purpose of securing new ideas, and in this way maintain their position in the industry. These proprietors will be well represented at the Philadelphia meeting and their action should be followed by others, with the additional assurance of abundant returns.

Trade Outlook

Pig iron values in all centers moved upward during the past month, and the heavy buying of steel making grades for the last half is indicative of an anticipated shortage for that period. Furnaces in the Mahoning and Shenango valleys disposed of practically 250,000 tons to independent steel interests on the basis of $21.85 Pittsburg and estimates place the available tonnage for the remainder of the year at less than 100,000 tons. These heavy sales of Bessemer have already resulted in advances on malleable grades, and acid steel foundries will likewise be compelled to pay higher prices for the bulk of their raw material. Foreign iron continues to be worked off westward in increasing quantities, sales of Middlesbrough having been made at Chicago on the basis of $28.50 for No. 2. For shipment during the third and fourth quarters, No. 2 foundry is quoted as follows in the principal iron centers: New York, $23.50; Philadelphia, $23.75; Pittsburg, $23.10; Cleveland, $22.50; Cincinnati, $22.25; Birmingham, $19.25, and Chicago, Southern, $23.35. Notwithstanding the strength of the iron market and the scarcity of metal for immediate requirements, gray iron castings have not advanced and a few jobbing foundries report a decline in the demand. In the malleable trade some of the large consumers are holding off for lower prices, although no concessions have as yet been announced. The continued high cost of labor and raw materials generally, despite the avalanche of orders burdening the malleable interests has curtailed profits and the net earnings are not in proportion to the increased volume of business transacted. Other branches of the foundry trade are similarly affected and in the brass line the scrap market is being scoured for desirable material to replace new metal. Aluminum is not only higher than ever before in the history of its commercial manufacture, but is also exceedingly scarce, and the requirements of melters are being but inadequately met. The increase in the use of this material in the construction of automobile bodies has been pronounced during the last twelve months, and the good results obtained from cast sections foreshadow a still greater growth in this branch of the trade. The installation of steel departments by gray iron founders marks a distinct departure in this industry and reflects a growing appreciation by these manufacturers of the rapid replacement of gray iron castings with steel. In the foundry supply trade, builders of molding machines report a heavy demand and deliveries of the larger sizes cannot be promised in less than three months. The scarcity of fish oil and its growing consumption have resulted in sharp advances, and other goods used largely in the foundries are feeling the effects of the unprecedented prosperity.

BOOK REVIEWS.

Mann's Tonnage Conversion Tables, for the use of weighmasters, billing clerks, freight clerks, and others. Published by William J. Mann, Tarrytown, N. Y. Price $2.00. This is a volume of 155 pages, 4½ by 6½ inches, containing tables for converting weights expressed in cwt. and quarters, into pounds, or weights expressed in short tons or pounds into gross tons and fractions thereof. The work is arranged in separate parts, with a thumb index for ready reference. The figures are printed in plain type, so that they can be quickly read.

REQUEST FOR CATALOGS.

Sikdar & Co., 1473 Maniktola Main Road, Calcutta, India, would like to receive catalogs, price lists and other printed matter from manufacturers and dealers in foundry equipment and pattern shop supplies.

ASSOCIATIONS AND SOCIETIES

Alexander E. Outerbridge Jr., in a paper read before the Pittsburg Foundrymen's Association, April 1, on "Fluxes and Alloys," expressed the belief that fluxing iron in a cupola has but little effect upon chemical changes. "What, then," he asked, "is the true function of fluxing of a cupola? My reply is that fluxing with limestone, oyster shells, fluorspar, etc., is useful mainly for the purpose of making a more fluid slag, thus preventing the slag, formed from the non-metallic substances, such as ash, sand, scoria, iron oxide, etc., from clogging the cupola when the bottom is dropped, or from becoming mechanically caught in the molten iron as it escapes from the spout. A thick pasty slag presages dull iron and dirty castings. Fluorspar makes an extremely fluid slag and is therein beneficial, but unfortunately, it also has a destructive action on ordinary cupola linings, and should be used cautiously on this account. The claim that fluorspar exerts any other beneficial more often, perhaps, with every influence on the molten iron, lacks confirmation from analyses.

Using No Flux.

"There does not appear to be any established rule or custom among foundrymen regarding the proper quantity of flux, or the best method of charging it in the cupola in order to obtain economically the best results; the proportion of flux to iron melted varies all the way from 1 to 20 to 1 to 60 or over. Sometimes the flux is placed on the bed of coal, sometimes on top of the iron charges, sometimes it is used only at the beginning, sometimes only at the end of the heat, and charge of iron. Where such wide latitude in method exists in practice, it is fair to infer that the use or non-use of fluxes in melting pig iron in a cupola has but little effect upon the character of the iron, i. e., upon its component elements. In my own practice, extending over about thirty years, I have tried all of these methods, and a great variety of fluxes, while for some time past, I have been using no flux of any kind in the cupola. It is proper to explain in this connection however, that in this case no coke is used, the melting in the cupolas being effected with anthracite coal, as economically, at present prices, as with coke, and with distinct advantages over coke with respect to the smaller amount of sulphur absorbed by the iron, the less quantity of slag formed, the greater length of time the metal will remain fluid after tapping, etc. The slag formed, when melting with anthracite, is so small in quantity that it is not tapped from the slag hole provided for the purpose and the space between the tuyeres and the lining of the bottom of the cupola is much less than is necessary when coke is used as fuel.

"To sum up in a few words, it may be readily inferred from the foregoing statements that I do not rely upon fluxing to improve the quality of the iron melted in a cupola, except in a very limited degree, but I do recognize the advantage accruing from the moderate use of fluxes, especially when coke is the fuel employed, in order to increase the fluidity of the slag, thus to assist the passage of the air blast through the burden, and finally to insure a clean drop when the melting is over.

Valueless Records.

Mr. Outerbridge asserted his conviction that tensile strength records of cast iron as given in technical books and magazines have no meaning or value unless the size of the test pieces are stated. A difference of ¼

inch in diameter of two iron tensile test bars cast from the same ladle of iron may make a difference of as much as 5,000 pounds per square inch in the record of tensile strengh. Moreover, with one kind or grade of iron the larger bar may be always the weaker, while with another kind of iron the smaller bar may always be the weaker of the two. "I have," said Mr. Outerbridge, "many records of such tests to substantiate these surprising statements. These facts surely suffice to prove that in cast iron we have an alloy of highly complex nature. It is a melange of one-half dozen well known elements, and not infrequently contains a trace of one or more comparatively rare metals, all of which exert an influence upon the properties upon the alloy. Thus, a small amount of titanium hardens cast iron, while tungsten seems to have an opposite influence. It is frequently asserted that a trace of copper renders cast iron very brittle. Yet I have alloyed copper with cast iron in various amounts from 0.1 to 1 per cent and have failed to discover this tendency. It certainly closes the grain."

Manganese Maligned.

Pointing out errors which are found in new text-books, Mr. Outerbridge said that the statement that manganese is a hardening element in cast iron is misleading. When present in excess—say 4 per cent—manganese makes gray iron very hard, but is hungry for sulphur and oxygen, and when added in powdered form in a small quantity to the ladle of molten high chilling metal, such as car wheel iron, instead of increasing the hardness of the metal, it has the opposite effect, because of its desulphurizing and deoxidizing influence. One pound of this powder added to a ladle of 600 pounds of car wheel iron changes nearly one-half of the combined carbon to the graphitic form, lowering the shrinkage of the metal nearly 28 per cent; taking out one quarter of the sulphur, causing a marked softening of the gray iron portion and an immense improvement in the strength and ductility of the car wheel. In conclusion Mr. Outerbridge said:

"Manganese has been universally maligned as a hardening element in cast iron, the authors of such statements failing to realize that it performs two distinct functions, one as a hardening element, if in excess; the other as a softener of high chilling iron when that element is otherwise deficient in quantity.

"I may venture to say, furthermore, that if the founder allows the proportion of manganese to fall too low—say below 0.3 per cent—he is certain to have complaints of hard castings. This was clearly shown in a paper on 'Hard Castings' read by Henry Souther at the meeting of the American Society for Testing Materials, July, 1905. After stating that castings had been submitted to him for examination on account of being too hard to machine, he says he found that the constituents were normal except manganese, viz., silicon 2.50 per cent; phosphorus 0.70 per cent; sulphur 0.08 per cent; carbon 3.50 per cent; manganese 0.16+ per cent. Means were taken to raise the manganese to the neighborhood of 0.50 per cent and as soon as this was done the difficulty disappeared in the machine shop and has not reappeared after months.

Use of Ferro-Silicon.

"Silicon is the great softener of all kinds of cast iron and is usually added in the cupola in the form of 'silvery gray pig,' which may contain anywhere from 4 per cent to 10 per cent of silicon. Sometimes alloys containing even more silicon are added with pig iron in the cupola for the purpose of enabling the mixture to carry a larger proportion of scrap than would otherwise be prudent. Silicon charged into cupola softens the metal, but always reduces its strength.

"I have announced on several occasions during the past two years, and published in various papers, the interesting, and I believe, valuable discovery that when an alloy of iron and

silicon is added to ladles of molten iron, in the form of high grade ferro-silicon (containing about 50 per cent of the latter metal) it not only softens, but at the same time strengthens the iron, thus reversing the universal experience that softening iron reduces its strength.

"The gain in strength varies with the kind of iron and the proportion of ferro-silicon added to the ladle. In some of my tests I have found an increase of over 25 per cent in strength with a decrease of hardness that is quite remarkable. These tests are easily made in any foundry where transverse test bars are cast and broken.

"Another interesting and important feature of this method of manipulation is that by varying the amount of powdered material added to the ladle the proportion of silicon can be changed to suit the requirements of any individual casting or any group of castings."

NEW ENGLAND FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the New England Foundrymen's Association was held at the Exchange Club, Boston, Wednesday, April 10. The committee appointed at the last meeting of the association to investigate the matter of shipping conditions, particularly in regard to obtaining redress on short weights in shipments of pig iron, coal and coke, reported it had held one meeting, but as the committee consisted entirely of local members, it was thought best to increase the committee to 15, and that the same be selected from different parts of New England in order that the committee might have a larger field to work from and be in a position to get more definite information in regard to the conditions existing in that section of the country. The chair appointed ten additional members and the full committee is as follows:

Jas. L. Anthony, chairman, Weir Stove Co., Taunton, Mass.
Wm. J. Breen, secretary, Hugh W. Adams & Son, Taunton, Mass.
Walter B. Snow, B. F. Sturtevant Co., Hyde Park, Mass.
Lewis E. Harper, Becker-Brainard Milling Mach. Co., Hyde Park, Mass.
Henry F. Arnold, American Tool & Machine Co., Hyde Park, Mass.
Henry A. Carpenter, A. Carpenter & Sons Fdy. Co., Providence, R. I.
B. M. Shaw, Walker-Pratt Mfg. Co., Watertown, Mass.
W. A. Jackson, Walworth Mfg. Co., Boston, Mass.
Chas. J. Caley, Russell & Erwin Mfg. Co., New Britain, Conn.
John F. Keyes, Reed Foundry Co., Worcester, Mass.
A. A. Brown, General Electric Co., Lynn, Mass.
Chas. F. Hildreth, Whitcomb Foundry Co., Worcester, Mass.
C. L. Prince, H. B. Smith Co., Westfield, Mass.
Chas. L. Newcomb, Deane Steam Pump Co., Holyoke, Mass.
C. R. Brown, Saco-Pettee Machine Shops, Newton Upper Falls, Mass.

Announcement was made that the next meeting of the association would be held in Boston on May 8, and that the executive committee had arranged with Roy U. Conger, New York, who will read a paper on "Scientific Salesmanship."

After a short intermission the meeting adjourned to dinner after which the president introduced as the speaker of the evening, Edwin A. Moore, president of the American Coke & Gas Consumption Co., Camden, N. J., who spoke on the subject: "By-products, Coke, Etc." His remarks were closely followed by the members and a brief discussion followed.

PHILADELPHIA FOUNDRYMEN'S ASSOCIATION.

At the monthly meeting of the Philadelphia Foundrymen's Association held at the Manufacturers' Club, March 3, Chairman E. E. Brown, of the general entertainment committee, made a lengthy report of the committee's work in the way of entertainment for the visiting delegates who will attend the convention of the American Foundrymen's Association in May. Plans are being satisfactorily carried out for the collection of funds to defray the necessary expenses, and the sub-committees are actively engaged in the arrangement of details for the various entertainments On Tuesday evening, May 21, a vaudeville entertainment and smoker will be given at Lu Lu Temple, while a shad dinner is being planned for Thursday evening, May 23. The sub-committee in charge of visitations to various industrial plants and other

points of interest has its work well under way and promises exceptional opportunities for plant inspections. Plans are also being made to entertain the visiting ladies, who will be given an opportunity to see the many points of historical interest in the Quaker city. The attendance at this convention already promises to be the largest in the history of the association and it has been estimated that probably 1,200 members and guests will be present. Entertainment is being provided for this number.

Chas. J. Caley, New Britain, Conn., first vice president of the American Foundrymen's Association, who attended the meeting, reported that plans for the formation of a Brass Founders' Association which is to be organized at the time of the convention are well under way, and the committee with this work in charge is encouraged by the interest already manifested by those engaged in the brass trades.

"The Hazard of Explosives in Large Cities and Spontaneous Combustion," was the subject of a paper read by Dr. Chas. F. McKenna, of New York. Dr. McKenna went into his subject in great detail and the experience of the Thomas Devlin Mfg. Co., Philadelphia, proved interesting. It was stated that in making shipments of castings in second-hand kegs it was found on their arrival at their destination that kegs were, in some cases, almost totally destroyed by fire. On investigation Dr. McKenna found that these kegs had been used for chemicals in connection with dye-house work, no doubt originally containing chlorate of potassium, a certain portion of which probably remained in the cracks and crevices of the kegs.

Capt. J. C. Colwell, commander of the cruiser Denver, lying at League Island navy yard, made a short address on "The Possibilites of Making the League Island Navy Yard the Largest Naval Station in the World." From both a strategical and practical view, he said, this was not only possible but quite probable.

ERIE FOREMEN.

The foundry foremen employed in the Erie, Pa., shops were tendered a banquet at the Reed house, in that city, on Saturday evening, April 6. A year ago the foremen entertained their employers and this affair was in the nature of a return engagement. Souvenirs in the form of ash trays were distributed. These were cast in one of the Erie foundries and bore the following inscription: "Banquet to the Erie Foundry Foremen's Association, April 6, 1907." Toasts were responded to as follows: "The Open Shop," W. F. Grunau; "Value of Co-operation," M. Griswold, Jr.; "Why We Should Have a Foundrymen's Association," Herman Giele; "Politics in the Foundry," James Hay; "The Apprentice in the Foundry," Harry E. Kies; "A Country Without Minerals," George T. Bliss; "Troubles in the Foundry," George A. Miller; "Cast Steel Remarks—No Blowholes," Charles Davenport.

Employers and foremen at the banquet represented the following foundries: Cascade Foundry Co., Globe Iron Works, Jarecki Mfg. Co., National Foundry Co., Walker Foundry Co., Erie City Iron Works, Erie Malleable Iron Co., South Erie Iron Co., Morse Iron Co., Odin Stove Co., Germer Stove Co., Skinner Engine Co., Erie Engine Co., Ball Engine Co., and Griswold Mfg. Co.

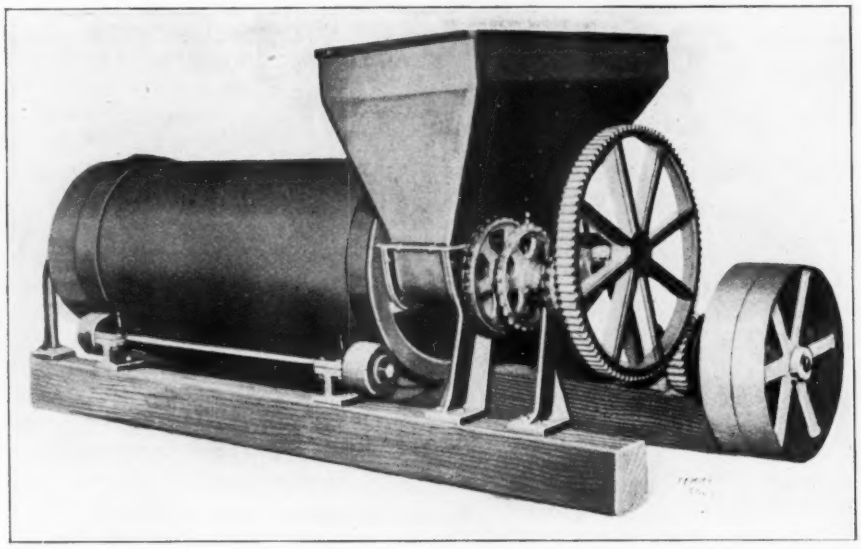
THE ASSOCIATED FOUNDRY-FOREMEN OF PHILADELPHIA AND VICINITY.

The twenty-sixth meeting of the Associated Foundry Foremen of Philadelphia and vicinity, which was held at Royal Arcanum hall, 36 North Ninth street, Philadelphia, April 8, was unusually well attended, an interesting program having proved the attraction. A. E. Outerbridge, Jr., read a paper entitled "Silicon Alloy for Softening, Strengthening and Cleaning Cast Iron," and a paper on "Lead Facings" was read by George Pettinous. "Magnesium Alloy as Applied to Bronze and Brass Casting" was discussed by W. O. Stule.

FOUNDRY AND PATTERN SHOP APPLIANCES AND SUPPLIES

Continuous Sand Mixer—Multiple Venting Tool—Portable Core Oven—Milwaukee Snap Flask—Trade Notes

The continuous mixer for facing and core sand shown in the accompanying illustration is built by the J. S. McCormick Co., Pittsburg. In operation the drum revolves with the material, and the steel spiral knives inside the drum move in the same direction at a speed three times that of the drum. This thoroughly cuts and agitates the mixture until it is conveyed by the spiral arrangement to the discharge end of the drum, where it is moistened with water or other liquids before being thrown out for use.



CONTINUOUS SAND MIXER

The drum is of heavy steel plate construction and revolves on four rollers. The spiral reel inside the drum consists of steel knives on a shaft 1 11-16 inches in diameter, and is attached to cast iron arms, being driven with gears from the main shaft. The hopper is arranged in two parts for the different materials to be mixed and the feeds are regulated for the quantities required. The hopper is also built without a partition when the mixtures are made up in batches before being put into the machine. The mixer can be arranged for either belt or motor drive.

MULTIPLE VENTING TOOL.

For venting grate bar cores rapidly and correctly, A. C. Pearce, Baton Rouge, La., has patented and is manufacturing a multiple venting tool, which it is claimed increases the output and can be easily used. The wires are spaced one inch insuring even and proper venting. These tools are made in two sizes, ten wire and 6 wire, the former being used for grates having cores 10 inches long or over, and the latter for small grates and short cores in circular grates. The tool is provided with two handles, and when in use the top handle is raised, pressed down and raised again, making as many holes through the core as there

are wires. For cores larger than ten inches this operation is repeated as many times as is necessary. The wires are made for any depth of drag.

A PORTABLE CORE OVEN.

Many attempts have been made to design an economical and at the same time efficient portable core oven. Most cores are baked in heavy brick structures which take up an unduly large amount of space, and which cannot be moved or shifted as development in the department requires more space and for changes in the general arrangement of the plant.

One objection to some types of ovens is that they are not adapted for drying long cores such as are made on core machines, as the clearance which must be left along the curved edge of the shelf reduces the area that can be covered with core plates. The objection to all ovens of the stationary shelf type is that the core plates have to be handled into and out of the oven through openings, which interfere with the draft or heat conditions and thus retard the baking of the cores in the oven.

Figs. 1 and 2 show two views of a drawer oven which is self-contained and economical. It is equipped with four drawers, supported by rollers at the back and by pipe guides at the front. The drawers are removed from the oven by slipping a pair of handles into the pipes shown in the front, lifting them slightly and running them forward by means of the wheels on the inside at the back of the shelves, the action being much like that of a wheelbarrow. The shelves are self-sealing, in that when they are drawn forward a plate closes the opening, so that the baking of the cores on the other shelves goes on without interruption. The shelves are shown open in Fig. 1, and are drawn to different distances, so as to illustrate the variety of cores which can be baked in an oven at one time. The large cores on the lower shelf are 7 inches in diameter.

This oven was run for an entire day on one bucketful of fine coke or breeze, swept up in the coke bin. The consumption of fuel in an oven of this kind would naturally be less than the stationary types, as the space is all utilized to the greatest possible extent,

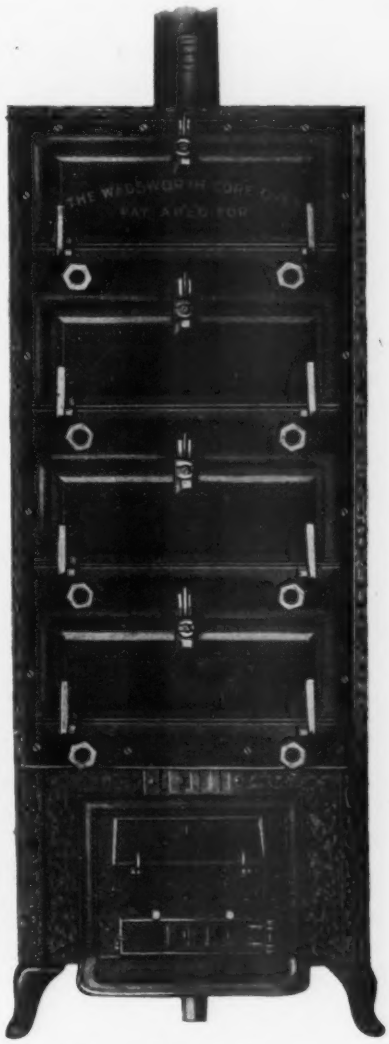


FIG. 1—FRONT VIEW OF PORTABLE CORE OVEN

there being no ducts or passages in which radiation takes place.

The fact that the fronts of the doors drop down as shown permits the core plates to be taken out easily. These ovens can be distributed about the core department, thus minimizing the dis-

tance the core makers have to walk to put their cores in the oven, and a rearrangement of the department can be effected very easily, as the portable oven is no more difficult to move than the core bench.

In an experimental run the temperature was found to be 450 degrees in practically all parts of the oven, and this temperature was easily maintained the entire day on the amount of coke already referred to.

One point in this oven to which especial attention is directed is the provision for supplementary shelves dividing the main drawers into divisions. As shown, the two highest drawers are divided into three shelves each, the next into two and the bottom one is arranged without any supplementary shelves. The facility with which these different divisions can be put in will enable the operator to dry any size of cores readily.

This device was designed by George H. Wadsworth, Cuyahoga Falls, who has applied for patent on the same, and is manufactured by the Falls River & Machine Co., Cuyahoga Falls, O.

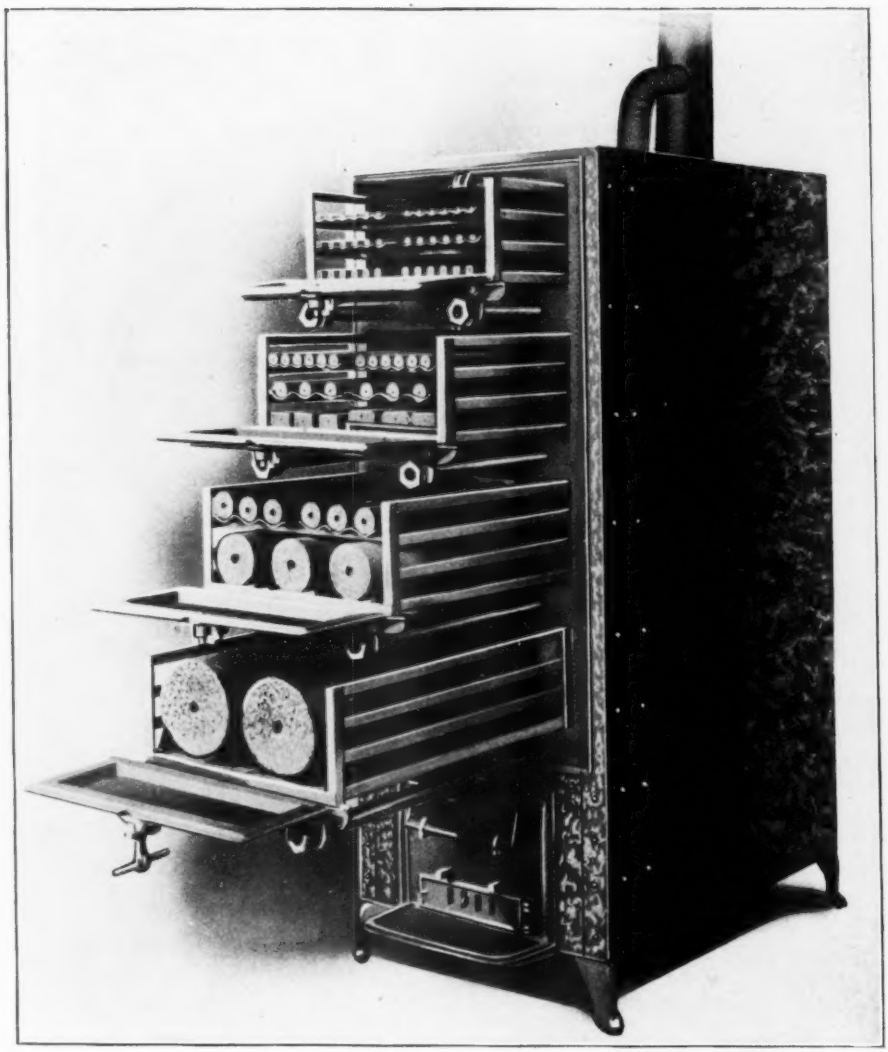
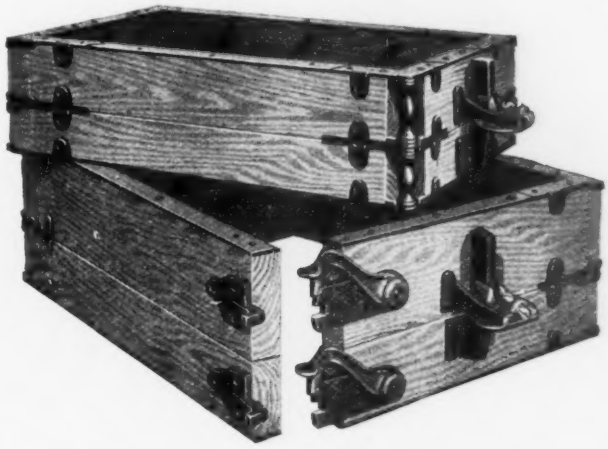


FIG. 2—SIDE VIEW OF PORTABLE CORE OVEN, SHOWING DRAWERS EXTENDED

SNAP FLASK.

The Milwaukee snap flask, shown herewith, is constructed of maple, ash, oak or hickory, with malleable iron trimmings. The edges, top and bottom are of steel, the corner irons having ears for the purpose of strengthening the corner plates, which are screwed on the inside and the outside of the flask. The pins and plates are made to secure an even lift and can be adjusted at any time to secure a perfect fit. The locking device prevents any reduction in the size of the flask by the shrinkage of the wooden portions, thus retaining the desirable feature of an iron flask at a great reduction in weight. This device is manufactured by the Chas. Jurack Pattern & Foundry Supply Mfg. Co., Milwaukee.



MILWAUKEE SNAP FLASK

TRADE NOTES.

The Hill & Griffith Co., Cincinnati, has recently been appointed western selling agents for the portable snap benches, manufactured by the Homogeneous Mixer Mfg. Co., Buffalo. Construction work on the company's new plant is progressing favorably and from present indications the new works will be completed June 1.

The Bury Compressor Co., Erie, Pa., manufacturer of air and gas compressors and vacuum pumps, has just completed an addition to its machine shop 150 by 70 feet, which increases the size of the building to 350 feet. New tools have also been added and the improvements will practically double the capacity of the plant.

The firm of Crowell & Peck, chemists, Cleveland, has been dissolved; Mr. Peck having purchased the laboratory equipment, including the testing and crushing plant. The business will be conducted under the firm name of Francis J. Peck Co., at the old location. Mr. Peck's fifteen years of successful experience in this line gives ample assurance of his ability to render expert services.

The B. F. Sturtevant Co., Boston, reports the following orders for high pressure rotary blowers: Otis Elevator Co., Chicago; the Macallen Co., South Boston, Mass.; United Oil & Refining Co., Beaumont, Texas; Lumsden & Van Stone Co., Boston; Johnson & Blanding, Providence, R. I., and Sharpless Separator Co., West Chester, Pa.

The Brown Specialty Co., Chicago, announces that it has closed a contract with the Thomas W. Pangborn Co., New York, for the exclusive sale of the Hammer core machines and equipment for the states of North Carolina, South Carolina, Georgia, Florida, and the Dominion of Canada, including a portion of Ontario, also the entire provinces of Quebec, New Brunswick and Nova Scotia, in addition to the New

England States, New York, New Jersey, Pennsylvania, Delaware, Maryland, District ot Columbia, Virginia and West Virginia heretofore controlled by them. For the convenience of owners of Hammer core machines the Thomas W. Pangborn Co. will carry in New York a complete stock of all the parts of this device.

The main offices of G. F. Ehrenzeller, dealer in pig iron, ferro-manganese, spiegeleisen, ores, metal and all kinds of ferro-alloys, has been removed from New York to the Pennsylvania building, Philadelphia.

The Green Engineering Co., Chicago, manufacturer of traveling link grates, is now completing a large plant at East Chicago, the main building of which is 350 feet long, and 150 feet wide, and will be used as a machine shop and erecting room. The foundry is 200 feet long and 150 feet wide. Two 10-ton cupolas have been installed by the Whiting Foundry Equipment Co., Chicago. A number of Macphail steel flasks are in operation on the molding floor and it is stated that one of these outfits, which consists of one cope, one drag, and six jackets, is doing the work of 250 cast iron flasks at a saving of 25 per cent in floor space. These flasks are manufactured by the Macphail Flask & Machine Co., Caxton building, Chicago.

Benedict Crowell, Cleveland, and C. B. Murray, formerly president of the metallurgical laboratory, Pittsburg, and for twelve years chief chemist of the Edgar Thomson plant of the Carnegie Steel Co., have organized the firm of Crowell & Murray, and have equiped a laboratory in the Perry-Payne building, Cleveland. The office force formerly with the firm of Crowell & Peck, Cleveland, has been engaged. Anouncement has also been made that the entire laboratory equipment, and the business conducted by Dr. Otto Wuth, Pittsburg, have been taken over by this concern.

The Goldschmidt Thermit Co., New York, announces the removal of its offices to the West street building. A Pacific coast branch was also established April 1, at 432-436 Folsom street, San Francisco, under the management of L. Heynemann, who will have charge of the business of this company in the states of California, Oregon, Washington and Nevada.

The Standard Sand & Machine Co., Cleveland, manufacturer of sand handling machinery, is erecting an addition 100 x 40 feet.

The J. D. Smith Foundry Supply Co., Cleveland, has secured the plant of the Variety Iron Works, Scranton and Carter streets, containing approximately 65,000 square feet floor space, for warehouse and manufacturing purposes. The main office will be removed to this location about May 1, although the present quarters will probably be maintained as a city distributing point for certain supplies. A modern machine shop will be one of the features of the new plant and ample room will also be provided for its growing engineering department. This company recently secured the sole rights in the United States for the sale of the Fisher side blow converter, invented by J. E. Fisher.

Wonham & Magor, New York recently received an order from the Atlantic Coast Liner Railway Co., for the complete equipment of its new foundry at Waycross, Ga. The order included cupola and lining, elevators, core ovens, tumblers, grinders, ladles, sand sifters, cars and trucks.

William C. Eaton has severed his connection with the Cincinnati office of Hickman, Williams & Co., and has formed a partnership with Frank R. Rhodes, under the firm name of Eaton, Rhodes & Co. Pig iron and coke will be handled by the new firm, which has secured offices in the First National Bank building, Cincinnati.

Charles A. Goehringer, formerly employed in the capacity of foreman in the brass foundry of the American Valve & Meter Co., Cincinnati, has been appointed eastern representative of the Foundry Specialty Co., Cincinnati, manufacturer of partine and fluxine, with headquarters in Philadelphia.

GENERAL INDUSTRIAL NOTES

The Hubbard Foundry Co., Hubbard, O., has been incorporated with a capital stock of $25,000. The incorporators are: W. D. Wright, M. T. Farragher, T. W. Crawford, P. J. Reddington and S. M. Thompson.

J. J. Reilley and Frank J. Doyle, proprietors of the Columbus Iron Stores Co., Columbus, O., have organized the American Castings Co., for the manufacture of brass castings for automobiles and similar purposes.

The National Iron Works, Spokane, Wash., has increased its capital stock from $15,000 to $60,000.

The Cincinnati Milling Machine Co., Cincinnati, has leased the foundry building on Patterson street and it will be occupied by the Modern Foundry Co. until the completion of its new plant at Oakley.

The Lorain Machine & Forge Co., Lorain, O., has increased its capital stock from $10,000 to $30,000, and is planning the erection of a brass foundry for the manufacture of an oil force pump for automobiles.

The A. R. Curtiss Mfg. Co., Champaign, Ill., has been incorporated with a capital stock of $50,000 to conduct a foundry and machine shop. The incorporators are Albert R. Curtiss, Morgan Brooks, and Adolph F. Swanson.

The Myers & Force Co., East Orange, N. J., has been incorporated to manufacture metal novelties in brass, German silver, aluminum, etc. The capital stock is $50,000. The incorporators are L. A. Myers Jr., J. W. Force and W. L. Myers, East Orange.

Emrick Bros. have sold their foundry in Hastings, Neb., to a company recently organized with a capital stock of $20,000. Frank Kealey will assume the management of the plant, which will be enlarged and improved. Emrick Bros. will remove to St. Louis to conduct a similar business.

A new company has been formed for taking over the plant of the Hercules Pipe Foundry, Anniston, Ala., and will begin the manufacture of soil pipe and fittings after spending about $25,000 in additions and improvements.

The Architectural Mold Co., Detroit, has been incorporated to engage in the manufacture of architectural molds and castings. The capital stock is $5,000 and the incorporators are: Eugene D. Allen, Paul Klebba, Herman A. Pleger, and Wallace T. Gagnier.

G. F. Elliott has sold the Pocomoke Machine Works, Pocomoke City, Md., for a consideration of $7,000, and they have been incorporated under the name of the Pocomoke Foundry & Machine Works. The plant will be under the management of R. Harlan and Clarence Robertson.

The business of Walter Connally & Co., Tyler, Tex., with a capitalization of $10,000, has been organized by C. W. Boon, C. L. Palmore, Walter Connally, Frank James, Clem H. Roberts and S. A. Fain, to conduct a foundry and machine shop.

A charter has been granted to the William Oliver Mfg. Co., Knoxville, Tenn., capitalized at $1,000,000. The incorporators are W. J. Oliver, who made the lowest bid on the canal contract; E. G. Oats, Alex. McMillan, J. T. Gaut, and other citizens of Knoxville. The company, of which Mr. Oliver is at the head, has been engaged in foundry work, the making of mining, milling and road implements, but the scope of work is now enlarged, and under its new charter the company may also manufacture railroad cars, railroad supplies, etc.

The recently completed plant of the American Roll & Foundry Co., Canton, O., will manufacture chilled rolls, rolling mill and tin plate machinery. The company begins operation with a large number of orders, and will employ from 100 to 150 men. James B. Baird, formerly president of the Canton Roll & Machine Co., is president.

The El Reno Foundry & Machine Co., El Reno, Okla., has recently increased its capital to $25,000.

The Wingold Stove Co., Ltd., has been incorporated by Frederick B. Blanchard, Otto Gensmere, Robert Kellow and others, with $40,000 capital and head office at Winnipeg, to manufacture stoves, furnaces, etc.

The stockholders of the Heimann Foundry & Machine Co., recently organized in Massillon, O., have elected H. A. Croxton president, August Heimann vice president, and F. G. Harrison secretary and treasurer, who, with J. C. Corns and F. W. Arnold, are the directors. The company, which is capitalized at $50,000, has purchased the business established by A. Heimann & Brother. Additions to the plant will be made at once.

The Lyman Mfg. Co., Buffalo, N. Y., manufacturer of metal specialties, states that it has incorporated its business, which has been in existence for the past year. The plant at present consists of a machine shop and foundry, and new equipment, mainly brass finishing machinery, is being constantly added.

The new plant of the Ensley Machine & Foundry Co., Ensley, Ala., is now in operation. The officers are: W. T. Palmer, president; E. J. Owens, vice president; A. H. Moore, secretary and treasurer.

The Cleveland Bell Mfg. & Foundry Co., Cleveland, has been incorporated by David V. Green, Siegfried F. Krauss, Ignatz Gabay, Harris Goldstein and David Klein, with a capital stock of $5,000. The new company is erecting a plant on Pittsburg avenue for the manufacture of bells of all kinds.

The Canadian Rand Co., Ltd., has been incorporated by George Doubleday, Ernest W. Oilman, Sylvester W. Jenkes, Wm. Farwell and others.

The Lunenburg Foundry Co., Ltd., is being organized at Lunenburg, N. S., with a capital stock of $50,000, to manufacture stoves and ranges, hot water boilers, hot air furnaces, and to do general foundry work. The company will install a machine shop in connection with its foundry, putting in new machines and a new line of patterns. It expects to have its plant in operation by June 1. J. C. Rockwell is interested.

Warden King, Ltd., has been incorporated by James C. King, Louis A. Payette, R. C. McMichael, and others, as iron founder and machinist, with $1,000,000 capital and head office at Montreal.

New Construction.

The Seaman-Sleeth Co., Pittsburg, manufacturer of rolls exclusively, has purchased a piece of ground 150 x 380 feet, across the street from its present plant, on which it will erect a steel building, brick enclosed, with slate roof, 40 x 150 feet, for use as a machine shop. It will be equipped with a 30-ton electric crane and modern machine tools, motor driven. The erection of another steel building is contemplated, to contain two 25-ton open-hearth steel furnaces and a foundry. The pattern shop has been dismantled and the ground will be used for a crane runway, with 35-ton electric crane, to serve the storage yard. These improvements, which will enable the company to make all sizes of steel rolls, will be completed early in the summer.

The Grey Iron Foundry & Machine Co., Reading, Pa., is to erect a new foundry, 30 x 150 feet, adjoining its present plant.

The Shull Steel Castings & Mfg. Co., Canton, O., will begin work on its new plant May 1, and expects to have it in operation by July 15. The plant will include a main structure, 60 x 240 feet, and two lean-tos, one 32 x 240 feet, and the other 34 x 75 feet. The plans provide for one 10-ton open-hearth furnace, and four electric traveling cranes will be installed. E. G. Van Horn is manager and treasurer of the company.

The C. W. Raymond Co., Dayton, O., manufacturers of clay working machinery, will erect a new plant and is in the market for a complete foundry and machine shop equipment for heavy work.

The American Brake Shoe & Foundry Co. has purchased a site of 14 acres at Chattanooga, Tenn., and will erect a plant to manufacture railroad supplies for its southern business. This will be one of the largest plants of its kind in the country. Plans are already prepared for a main building, 150 x 300 feet.

About $30,000 is to be spent by the Globe Malleable Iron Co., Syracuse, N. Y., in doubling the size of its plant. Three one-story buildings will be erected, of reinforced concrete and steel, 80 x 160, 20 x 180, and 60 x 100 feet, respectively. The equipment to be purchased includes tumbling barrels, molding machines, jib cranes and conveyors for handling coal and sand.

The Southern Skein & Foundry Co., Chattanooga, Tenn., is building a large plant at East Lake. The buildings will comprise a foundry, 75 x 200 feet; machine shop, 50 x 150 feet, two stories; and power house, 54 x 90 feet, all to be of fireproof construction.

The Williams Foundry & Machine Co., Akron, O., is replacing its foundry, which was recently burned, with a new brick building, 40 x 80 feet. None of the equipment was damaged beyond repair, and the company is not in the market for any new machinery.

The Standard Cast Iron Pipe & Foundry Co. has already purchased part of the equipment for its new plant to be erected in Bristol, Pa. This plant will consist of 13 buildings, the largest of which will be a machine shop, 83 x 203 feet, and two foundry buildings, one of which will be 101 x 459 feet, and the other 129 x 189 feet.

An addition, 32 x 90 feet, is to be built to the foundry and blacksmithing department of Girard College, Philadelphia.

The Erie Malleable Iron Co., Erie, Pa., is making extensive additions to its plant which, when completed, will increase the molding floor at least one-third. Another furnace will also be installed.

The Industrial Works, Bay City, Mich., will build an addition, 130 x 250 feet, which will be used as a foundry for the manufacture of iron and steel castings. Entire equipment will be purchased.

A foundry which will have a capacity of about 50 tons will be added to the plant of the Imperial Engine Co., Painted Post, N. Y., and additions will also be made to the machine shop.

The Haynes-Langenberg Mfg. Co., St. Louis, will erect a foundry building, 80 x 140 feet, two stories, to be equipped for the manufacture of ranges.

The Oakville Foundry Co., Oakville, Conn., is building a brick foundry addition 40 x 200 feet.

The North & Judd Mfg. Co., New Britain, Conn., is preparing to erect an addition to its foundry.

Plans have been prepared for the new plant of the Clyde Iron Works, Duluth, Minn. The drawings provide for nine buildings and will include extensive foundries.

Fires.

The brass foundry of the J. G. Brill Co., Philadelphia, was damaged $10,000 by fire on April 5.

The foundry plant of the St. Paul Foundry Co., St. Paul, Minn., was recently damaged by fire, which destroyed the core rooms and entailed a loss of approximately $10,000. The other departments were not affected and the plant has continued in operation with but slight interruption.

The plant of the Magnolia Stove Works, Memphis, Tenn., was damaged $50,000 by fire March 29.

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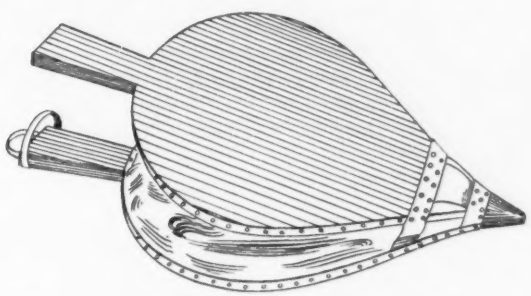

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Foundry Engineering:
Lane, H. M., Cleveland.

Foundry Equipment (Iron & Brass):
Barnett, Oscar, Foundry Co., Newark.
Etting, Edward J., Philadelphia.
Koppel Co., Arthur, Pittsburg, Pa.
Obermayer, S. Co., Cincinnati.
Pangborn, Thos. W. Co., New York.
Sly, W. W., Mfg. Co., Cleveland.
Standard Sand & Machine Co., Cleveland.
Stevens, F. B., Detroit.
Taylor, Robert J., Inc., Philadelphia.
Wonham & Magor, New York.

Foundry Supplies:
Detroit Foundry Supply Co., Detroit.
Hill & Griffith Co., Cincinnati.
McCormick, J. S. Co., Pittsburg.
Obermayer, S. Co., Cincinnati.
Osborn Mfg. Co., Cleveland.
Pangborn, Thos. W. Co., New York.
Paxson, J. W. Co., Philadelphia.
Shanafelt Mfg. Co, Canton, O.
Smith, J. D., Foundry Supply Co., Cleveland.
Stevens, F. B., Detroit.
Taylor, A. L., San Francisco.
Taylor, Robert J., Inc., Philadelphia.

Furnaces (Melting):
Barnett, Oscar, Foundry Co., Newark, N. J.
Buffalo Furnace Works, Buffalo.
Monarch Engineering & Mfg. Co., Baltimore.
Paxson, J. W. Co., Philadelphia.
Rockwell Engineering Co., New York.

Graphite:
United States Graphite Co., Philadelphia.

Grinding Machinery:
Adams Co., Dubuque, Ia.
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Norton Co., Worcester.
Ransom Mfg. Co., Oshkosh, Wis.

Grinding Wheels:
Norton, Co., Worcester, Mass.

Hammers:
Independent Pneumatic Tool Co., Chicago.

Hammers (Pneumatic):
Chicago Pneumatic Tool Co., Chicago.

Heating & Ventilating Apparatus:
American Blower Co., Detroit.
Sturtevant, B. F. Co., Hyde Park, Mass.

Hoists:
Curtis & Co. Mfg. Co., St. Louis.
General Pneumatic Tool Co., Montour Falls, N. Y.
Harrington, Edwin, Son & Co., Philadelphia.
Niles-Bement-Pond Co., New York.
Northern Engrng. Works, Detroit.
Pawling & Harnischfeger, Milwaukee.
Sellers, William, & Co., Inc., Philadelphia.
Sturtevant, B. F. Co., Hyde Park, Mass.
Whiting Fdy. Equipment Co., Harvey, Ill.
Yale & Towne Mfg. Co., New York.

Hoists (Electric):
Yale & Towne Mfg. Co., New York.

Hoists (Hand):
Yale & Towne Mfg. Co., New York.
Northern Engrng. Works, Detroit.

Hoists (Pneumatic):
Chicago Pneumatic Tool Co., Chicago.
Ridgway, Craig, & Son, Coatesville, Pa.

Hydrofluoric Acid:
General Chemical Co., Philadelphia.

Industrial Ry. Equipment:
Atlas Car & Mfg. Co., Cleveland.
Koppel Co., Arthur, Pittsburg, Pa.
Wonham & Magor, New York.

Iron Ore:
Rogers, Brown & Co., Cincinnati.

Ladles:
Koppel Co., Arthur, Pittsburg, Pa.
Northern Engrng. Works, Detroit.
Smith, J. D., Foundry Supply Co., Cleveland.

Magnets (Lifting):
Electric Controller & Supply Co., Cleveland.

Malleable Iron Melting Furnace:
Buffalo Furnace Works, Buffalo.

Molding Machines:
Adams Co., Dubuque, Ia.
Arcade Manufacturing Co., Freeport, Ill.
Berkshire Mfg. Co., Cleveland.
Bonvillain, Ph., & E. Ronceray, Paris, France.
Herman Pneumatic Machine Co., Zelienople, Pa.
Manning, Maxwell & Moore, New York.
Maywood Foundry & Machine Co., New York.
Mitchell-Parks Mfg. Co., St. Louis.
Mumford, E. H. Co., Philadelphia.
Paxson, J. W. Co., Philadelphia.
Pridmore, Henry E., Chicago.
Rathbone, John A., Detroit.
Smith, J. D., Foundry Supply Co., Cleveland.
Tabor Mfg. Co., Philadelphia.

Packing (Rubber Sheet):
Smooth-On Mfg. Co., Jersey City.

Parting Compounds:
Doggett, Stanley, New York.
Foundry Specialty Co., Cincinnati.
Partamol Co., New York.
Smyth, Swoboda & Co., New York City.

Pattern Letters:
Shanafelt Mfg. Co., Canton, O.

Patterns (Metal & Wood):
Herman Pneumatic Machine Co., Zelienople, Pa.

Pattern Shop Equipment:
Fox Machine Co., Grand Rapids, Mich.

Phosphorizers:
McCullough-Dalzell Crucible Co., Pittsburg.
New Era Mfg. Co., Kalamazoo.

Pig Iron:
Addy, Mathew, & Co., Cincinnati.

(Continued on page 142.)

A case in point

By the methods we installed, a foundry whose full capacity was supposed to be 12 tons per day with a cost of $3.44 per 100 lbs., was shown to be operating at a loss of several thousand dollars per month. It was actually possible to buy a certain class of castings at a less cost than the foundry in question could produce them.

The cost record we installed resulted in a thorough overhauling of several departments. In two months the foundry was producing at a rate of 17 tons per diem, and the cost per 100 lbs. had dropped from $3.44 to $2.75. Under their old methods the loss which this foundry was suffering every month and the conditions at fault could not possibly have been discovered until the end of the fiscal year.

A system of cost accounting that doesn't give you all the facts you want when you want them is sometimes very expensive.

Our foundry work is under the personal supervision of Mr. Ellsworth M. Taylor.

Systematizing department

Library Bureau

316 Broadway, New York

Baird & West, Detroit.
Bartlett, N. S. & Co., Boston.
Columbus Iron & Steel Co., Columbus.
De Camp Bros. & Yule, St. Louis.
Domhoff & Joyce Co., Cincinnati.
Elliott, Debevoise & Anderson, New York.
Field, Robert, Sales Agency, Cincinnati.
Goodrich, F. A. & Co., Detroit.
Hillman, J. H. & Son, Pittsburg.
McKeefrey & Co., Leetonia, O.
Mohr, J. J., Philadelphia.
Nash, Isham & Co., New York.
Pickands, Brown & Co., Chicago.
Pickands, Mather & Co., Cleveland.
Pilling & Crane, Philadelphia.
Rogers, Brown & Co., Cincinnati.
Shepard, Chas. G., Buffalo.
Stevens, F. B., Detroit.
Thomas Furnace Co., Milwaukee.
United Iron & Steel Co., Pittsburg.
Walter-Wallingford & Co., Cincinnati & Pittsburg.

Plumbago:

Dixon Crucible Co., Jos., Jersey City.
Gautier, J. H. & Co., Jersey City, N. J.
Hill & Griffith Co., Cincinnati.
McCullough-Dalzell Crucible Co., Pittsburg.
Obermayer, S. Co., Cincinnati.
Pettinos Bros., Bethlehem, Pa.
Ross-Tacony Crucible Co., Philadelphia.
Smith, J. D., Foundry Supply Co., Cleveland.
Stevens, F. B. Detroit.
United States Graphite Co., Philadelphia.

Polishers' & Platers' Supplies:

Stevens, F. B., Detroit.

Riddles:

Adams Co., Dubuque, Ia.

Sand:

Albany and No. River Molding Sand Co., Albany, N. Y.
Newport Sand Bank Co., Newport, Ky.
Pangborn, Thos. W. Co., New York.
Paxson, J. W. Co., Philadelphia.
Standard Sand & Machine Co., Cleveland.
Stevens, F. B., Detroit.

Sand Blast Machinery:

Drucklieb, C., New York.
Pangborn, Thos. W. Co., New York.
Paxson, J. W., Co., Philadelphia.
Tilghman-Brooksbank Sand Blast Co., Philadelphia.

Sand Mixing Machinery:

Falls Rivet & Machine Co., Cuyahoga Falls, O.
Mumford, F. H., Philadelphia.
Pangborn, Thos. W. Co., New York.
Sellers, William & Co., Inc., Philadelphia.
Standard Sand & Machine Co., Cleveland.
Stockham Homogeneous Mixer Mfg. Co., Piqua, O.

Sand Sifters:

Chicago Pneumatic Tool Co., Chicago.
Deane Steam Pump Co., Holyoke, Mass.
Hanna Engrng. Works, Chicago.
Herman Pneumatic Machine Co., Zelienople, Pa.
Standard Sand & Machine Co., Cleveland.
U. S. Chaplet Supply Co., New York.

Saws (Cold Cutting):

Tabor Mfg. Co., Philadelphia.

Seacoal:

Hill & Griffith Co., Cincinnati.
Obermayer, S. Co., Cincinnati.
Paxson, J. W. Co., Philadelphia.

Separators (Magnetic):

Dings Electro Magnetic Sep. Co., Milwaukee.
Elm City Engineering Co., New Haven.
Pangborn, Thos. W. Co., New York.

Shafting (Flexible):

Stow Mfg. Co., Binghamton, N. Y.

Shifter Box:

Federal Steel Fixture Co., Chicago.

Shop Equipment:

Mfg. Equipment & Engineering Co., East Boston, Mass

Shovels:

Stevens, F. B., Detroit.

Sprue Cutters:

Barnett, Oscar, Fdy. Co., Newark.
Shuster, F. B. Co., New Haven.
Middleditch, Benj., Detroit.

Stoppers:

McCullough-Dalzell Crucible Co., Pittsburg.
Ross-Tacony Crucible Co., Philadelphia.
Taylor, Robert J., Inc., Philadelphia.

Stove Trimmings:

Burdick & Son, Albany, N. Y.

Testing Machines:

Keep, W. J., Detroit.

Thermit Process:

Goldschmidt Thermit Co., New York.

Tools (Molders'):

Dobson, William, Canastota, N. Y.
Obermayer, S. Co., Cincinnati.
Paxson, J. W. Co., Philadelphia.
Smith, J. D., Foundry Supply Co., Cleveland.

Tools (Pneumatic):

Chicago Pneumatic Tool Co., Chicago.
Independent Pneumatic Tool Co., Chicago.

Tramrail Systems:

Randall, R. T. & Co., Philadelphia.

Trolleys:

General Pneumatic Tool Co., Montour Falls, N. Y.

Tumbling Mills:

Adams Co., Dubuque, Ia.
Falls Rivet & Mch. Co., Cuyahoga Falls, O.
Gilmour, J., New York.
Sly, W. W., Mfg. Co., Cleveland.
Smith, J. D., Foundry Supply Co., Cleveland.

Turn Tables:

Koppel Co., Arthur, Pittsburg, Pa.

Twyers, Cupola:

Watt Cupola Twyer Co., Barnesville, Ohio.

Wire Straighteners:

Blake, Geo. F., Mfg. Co., New York City.
Shuster, F. B. Co., New Haven.

USE

PARTAMOL!

THE "NEVER STICK" PARTING

The Most Reliable and the Surest Compound for Parting Moulds in which Brass, Bronze, Ornamental Iron and Steel are Cast. Universally Adopted in Brass, Bronze, Iron and Steel Foundries.

A MOST PERFECT PARTING COMPOUND OTHERS USE IT. WHY NOT YOU?

1. **ACTS** as a perfect Separator.
2. **PREVENTS** the sand sticking to the pattern, and consequently produces a sharp, clean and perfect mold.
3. **PERMITS** the mold to absorb the water thoroughly—standing proper swabbing without the water running.
4. **ALLOWS** of easy and perfected 'slicking' of the mold.
5. **TURNS OUT A TRUE AND PERFECT MOLD** with every line, shape and conformation truly delineated as in the pattern.
6. **HENCE,** prevents imperfect corners and lines, defective designs, and 'sand stuck' castings.

* * *

Users of other compounds know that they stick to the molds, preventing the facings from operating properly "PARTAMOL" never sticks to the mold. When it parts it disappears.

As against the cost of the article, we figure the value of the proposition to you to work out as follows:

1. **EXCELLENT RESULTS** in your castings, from the largest ornamental structural shapes down to the smallest piece.
2. **THE DISCONTINUANCE** of patching and fixing up imperfect molds.
3. **ELIMINATION** of high priced, inflammable and wasteful materials from your foundry.
4. **GREATER EFFICIENCY** of, and personal satisfaction for, your molders.
5. **SAVING** in your time. Better net results.

* * *

Our steadily and increasing list of customers is convincing support for the claims made for **"PARTAMOL,"** and our assertion of a large **NET VALUE** to those using it.

A further use for "PARTAMOL" may be found on LARGE PATTERNS, such as flywheels, etc., and all heavy "green sand" work, where the application of this material over a coat of kerosene works a perfect result.

Among its many other uses it is ABSOLUTELY INVALUABLE for Moulding Machine work. The price will please you. Samples on Request. Ask your jobber or

THE PARTAMOL COMPANY

415 BROADWAY NEW YORK

CLASSIFIED ADVERTISEMENTS

Wanted and For Sale advertisements 40 cents a line. Positions and Help Wanted 25 cents a line. Count seven words to the line.

SUPERINTENDENT WANTED

FIRST-CLASS EXPERIENCED SUPERINTENDENT WANTED. Three Malleable Furnaces and Two Gray Iron Cupolas. Excellent Organization, No Trouble. Address Secretary, St. Louis Malleable Casting Co., St. Louis, Mo.

ASSISTANT FOUNDRY SUPERINTENDENT WANTED for plant making light Gray Iron Castings. Must be a practical Molder and able to handle men. A splendid opening for a bright and active man. State fully, age, experience and salary expected. Box 978, THE FOUNDRY, Cleveland, Ohio.

SUPERINTENDENT WANTED, of an Iron Foundry manufacturing stoves, ranges and cast iron boilers, employing about one thousand hands. One who has a thorough knowledge of molding as well as mechanical experience. An excellent opportunity for the right party. Address Box 970, THE FOUNDRY, Cleveland, O.

FOUNDRY FOREMAN WANTED

FOREMAN WANTED, jobbing work, cast iron foundry about 10 tons per day; must be experienced, sober and hustler. State wages expected and give references. Address Box 976, THE FOUNDRY, Cleveland, Ohio.

FOREMAN capable of starting small Malleable Iron Foundry wanted. Write, giving references, experience and wages expected. Steady position for the proper applicant. Box 937, THE FOUNDRY, Cleveland, Ohio.

NON-UNION FOREMAN WANTED for jobbing work in cast iron foundry near Cleveland, about 15 tons per day. State experience, references and salary wanted. Address Box 977, THE FOUNDRY, Cleveland, O.

FOUNDRY FOREMAN. Wanted an experienced practical foundry foreman in a large establishment doing work of miscellaneous character. Address by letter with references to Box 965, THE FOUNDRY, Cleveland, O.

FOREMAN, familiar with heavy dry sand work, wanted by one of the largest steel foundries in the East. Applicants should give full particulars concerning their experience. Address Box 956, THE FOUNDRY, Cleveland, O.

FOUNDRY FOREMAN WANTED. Experienced man, capable of taking full charge of jobbing and machinery foundry, employing 50 molders. Chance for the right man to secure interest in firm. No labor trouble. Address with references Box 981, THE FOUNDRY, Cleveland, Ohio.

FOREMAN WANTED for machine and bench molding department of iron foundry making large quantities of small castings. Old established concern in the vicinity of Boston. No labor troubles. Open shop. Steady employment for an experienced hustler. Address Box 975, THE FOUNDRY, Cleveland, O.

GENERAL FOREMAN for gray iron foundry in East employing 100 molders and coremakers. Must be good on rigging and up-to-date in modern methods. Liberal treatment to a progressive and energetic man. State age, experience, references, full records, previous service, and minimum salary acceptable until ability is demonstrated. Answer in detail. Hapgoods, 305 Broadway, N. Y.

PATTERNSHOP HELP WANTED

TEN STOVE PATTERN MAKERS (Wood) Wanted. Steady employment; good wages. The Wehrle Co. Newark, Ohio.

PATTERN MAKER, Working Foreman, Medium Size Shop. We want a man who can make both wood and brass patterns and who has had experience in making iron pump patterns. Address Lock Box B, Greenville, Ohio.

CORE ROOM HELP WANTED

FIRST CLASS FOREMAN WANTED for core room. Malleable iron department of large foundry in southern city. Address Box 974, THE FOUNDRY, Cleveland, O.

CORE ROOM FOREMAN FOR STEEL FOUNDRY employing twenty men. Must be up to date on different core mixtures and establishing piece work prices; non-union. State where last employed and salary expected. Address Box 984, THE FOUNDRY, Cleveland, O.

FOREMAN FOR CORE ROOM employing 12 men on agricultural implements. Must be strictly up-to-date in making different core mixtures and establishing piece-work prices. Non-union. State age, experience, references and wages expected. Address Box 859, THE FOUNDRY, Cleveland, Ohio.

MOLDERS WANTED

EXPERIENCED HEAVY IRON MOLDERS WANTED AT ONCE. Good wages, steady employment. The Hooven, Owens, Rentschler Co., Hamilton, Ohio.

TWO MOLDERS FOR HEAVY ENGINE WORK WANTED.

Non-union. Good wages. Steady and permanent employment. Address Chuse Engine & Mfg. Co., Mattoon, Ill.

AT ONCE eight first-class, all-round green-sand, non-union molders, accustomed to medium floor work, pieces weighing 100 to 1,500 lbs. each. Only sober, industrious molders, with good recommendations need apply. We want steady men, and will guarantee a year's job to molders who make good. No trouble in the shop. Non-union shop for three years. Address Box 902, THE FOUNDRY, Cleveland, Ohio.

SALESMAN WANTED

FIRST-CLASS FOUNDRY EQUIPMENT SALESMAN wanted. One with practical experience with molding machines preferred. W. R. Colcord Machinery Co., St. Louis.

HELP WANTED, MISCELLANEOUS

WANTED for foundry in Canada doing General Foundry work, energetic, competent all around man, with knowledge of structural work., R. R. repairs, etc. Address, giving references, age, etc., Box 980, THE FOUNDRY, Cleveland, Ohio.

SUPERINTENDENTS WANT POSITIONS

CORRESPONDENCE SOLICITED from Stove Manufacturers contemplating a change in management of their plant. Reference given as to ability, character, habits and experience. Address Box 919, THE FOUNDRY, Cleveland, O.

INVESTMENT

I want to buy an active or controlling interest in a cast steel or malleable iron foundry located preferably in Northern Illinois. Have $25,000.00 to $100,000.00 to invest. Please give full particulars, as they will be treated as strictly confidential. Box 979, THE FOUNDRY, Cleveland, Ohio.

PATTERNSHOP HELP

AN EXPERIENCED FOREMAN PATTERNMAKER desires situation. Address Box 946, THE FOUNDRY, Cleveland, O.

COREROOM HELP

POSITION WANTED by a practical coremaker, to take charge of large core room. West of Pittsburg preferred. Address Box 982 THE FOUNDRY, Cleveland, O

EXECUTIVE POSITIONS WANTED

POSITION AS SUPERINTENDENT OR MANAGER wanted. 18 years' experience on all classes of heavy and light work. Mixing and melting iron with air furnace or cupola. First class references. Address Box 967 THE FOUNDRY, Cleveland, O.

POSITION AS FOUNDRY SUPERINTENDENT WANTED by young man. Experienced chemist—handled 70 molders the last three years, on high grade work, pressure parts—executive ability—can produce results. Good systematizer. Box 963, THE FOUNDRY, Cleveland, O.

POSITION AS SUPERINTENDENT OR FOREMAN wanted. Gray iron preferred. Strictly temperate and married. Up-to-date in Foundry practice and all its branches. Understand machines and cupola, furnaces and brass. Employed at present but wish to make a change. Box 973, THE FOUNDRY, Cleveland, O.

POSITION AS FOUNDRY MANAGER wanted by man of 30. Expert with cupola, good mixer of metal, well posted on up-to-date foundry methods, can handle men to best advantage and will install a system of costs. A technical education, chemist, plus a foundry training. Address Box 964, THE FOUNDRY, Cleveland, O.

FOREMANSHIP WANTED

POSITION AS FOREMAN WANTED by a first-class foundryman with good executive ability on light and heavy work. Can furnish best of references. Address Box 926, THE FOUNDRY, Cleveland, Ohio.

PRACTICAL FOUNDRYMAN WISHES POSITION as foreman. Five years a foreman. Acquainted with modern foundry details. Familiar with molding machines. Address Box 985, THE FOUNDRY, Cleveland, O.

POSITION AS FOREMAN in a light gray iron shop wanted. Twenty-two years' experience as molder. Understand molding machines and cupola practice. Can furnish reference. Address Box 931, THE FOUNDRY, Cleveland, O.

BRASS FOUNDRY FOREMAN desires position. Experienced on heavy and light bench and floor work and well up on modern foundry practice. Best of references furnished. Address Box 972, THE FOUNDRY, Cleveland, O.

POSITION AS FOREMAN OR FOUNDRY CHEMIST WANTED by experienced molder who is graduate in chemistry, of the International Correspondence Schools. References. Address Box 969, THE FOUNDRY, Cleveland, O.

POSITION AS FOREMAN WANTED in Machinery Foundry. Twenty years' experience. Foreman 9 years. Well up in foundry practice, green and dry sand, or loam. Best references. Address Box 983, THE FOUNDRY, Cleveland, O.

FOUNDRY FOREMAN would like to make a change. At present have charge of shop making light and heavy, green and dry sand work. Have had 25 years experience. Good references. Correspondence solicited. Address Box 966, THE FOUNDRY, Cleveland, O.

POSITION AS FOREMAN WANTED by man with 14 years' experience. All kinds of high grade castings. Two years foreman. At present employed. Technical training. Hustler with references. Box 971, THE FOUNDRY, Cleveland, Ohio.

POSITION AS GENERAL FOREMAN. 12 years' experience as Superintendent or Foreman on Steam and Water Heaters and Radiators. I am looking for a good proposition and will furnish A1 references. Address Box 924, THE FOUNDRY, Cleveland, O.

POSITIONS WANTED, MISCELLANEOUS

A PRACTICAL FOUNDRYMAN, up-to-date in mixing of iron, perfect in core work, also in green and dry sand and loam, best of character and sober, wants to change position. Open shop preferred. Address Box 939, THE FOUNDRY, Cleveland, O.

PROPERTY FOR SALE

FOUNDRY COMPLETE, two cranes, machinery patterns. Brick building, side track, etc. Box 347, Celina, Ohio.

JOBBING IRON AND BRASS FOUNDRY FOR SALE. Located in Western Pennsylvania. Price $6,000. Address Box 910, THE FOUNDRY, Cleveland, O.

BRASS FOUNDRY for sale, good will and fixtures, making Marine work at Philadelphia, Five Thousand Dollars, or will take partner with half interest, Twenty-five Hundred Dollars. Address Box 962, THE FOUNDRY, Cleveland, O.

FOUNDRY AND MACHINE SHOP OPENING. The Receiver of the Tyrone Foundry & Machine Co., is in position to sell the works or reorganize a Company on very advantageous terms either way to any one interested. The plant is a modern one and at present in very good condition and full of work. Address J. L. Porter, Receiver, Tyrone Foundry & Machine Co., Tyrone, Pa.

CUPOLAS, ETC., FOR SALE

TWO SECOND-HAND CUPOLAS IN FIRST-CLASS condition. Shells 72"-82" in diameter and about 40 feet high. Box 800, THE FOUNDRY, Cleveland, Ohio.

ONE SECOND-HAND CUPOLA in first-class condition for sale, capacity 4 to 5 tons per hour, diameter of shell 48", diameter inside of lining 34", total height 72', complete with lining. Can be seen at our shops in position. Address Ames Iron Works, Oswego, N. Y.

BLOWERS FOR SALE

No. 9 BUFFALO BLOWER on an iron frame foundation with counter shaft complete. In excellent condition, used only six months. Adrian Steel Casting Co. Adrian, Mich.

ONE NO. 2 ROOTS BLOWER For Sale, direct connected with upright Engine. Used but 30 days. A bargain, or will exchange for a No. 3.
Address Bolivar Foundry & Machine Co., Bolivar, Pa.

BLOWER BARGAINS.
Roots Second-Hand Blowers, bought, sold or exchanged for new ones. Address,
H. M. PAPWORTH,
120-122 Liberty Street, New York City.

CORE OVEN FOR SALE

CORE OVEN—MILLETT PORTABLE. Used about 60 days only, excellent condition, at $75.00 F. O. B., here. Gisholt Foundry Co., Madison, Wis.

CONTINUED ON PAGE 146

MOLDING MACHINE FOR SALE

ONE TABOR PNEUMATIC MOLDING MACHINE for sale. 13 x 18 (good as new) including 12 flasks and boards. Address Box 968, THE FOUNDRY, Cleveland, O.

FOR SALE, MISCELLANEOUS

FLUOR SPAR.—Every grade. Quotations delivered anywhere. Cheapest suppliers. Address GEO. G. BLACKWELL SONS & CO., Ltd., Liverpool, Eng., or Agents Penna. Salt Mfg. Co., Pittsburg, Pa.

PHOSPHORUS STICKS OR CAKES for phosphorizing bronze, tin and other metals. J. W. Paxson Co., Philadelphia, Pa.

One 3-ton Geared Ladle and Bail, for sale. Never used. Reason for selling, too large for our use. Address Roeper-Kincaid Mfg. Co., Reading, Pa.

OUTERBRIDGE SILICON ALLOY makes softer, stronger and cleaner castings, allowing you to use cheaper irons. J. W. Paxson Company, Philadelphia, Pa.

Machinery for Sale.

One seven-ton Steam Foundry Ridgway Jib-Crane.

One Connersville Positive Blower, 45 cubic feet capacity.

One Positive Direct Root Blower, 20 cubic feet capacity.

Casey-Hedges Company, Chattanooga, Tenn.

PULLEY MACHINES FOR SALE

2 No. 1
2 No. 2
1 No. 3
1 No. 4

with single and double belt patterns ranging from 6″ to 48″ and arms and hubs to suit.

All machines and patterns in first-class condition, also 40,000-lb. Iron Flasks for various size pulleys. Davison Foundry Co., E. Chicago, Ind.

SECOND-HAND MATERIAL AS FOLLOWS:

2 No. 7 Baker Blowers with Engines.
1 No. 7 Green Blower and Engine.
1 each—No. 3, 4 and 5 Baker Blowers, belt-driven.
1 each—No. 6 and 7 Sturtevant Blower, motor-driven.
1 No. 5 Sturtevant Blower, belt-driven.
1 each—1½, 2, 7, 12 and 25-ton Geared Ladles.
Colliau Cupolas, 72″-63″-42″-35″.
Air Melting Furnace 20 tons.
1 No. 80 Eureka Core Oven.
2 Millet Core Oven, stationary.
1 Erie Air Compressor, 6″ x 6″, belt-driven, automatic cut-off, $125.
1 Sellers Centrifugal Sand Mixer.

J. W. Paxson Co., Philadelphia, Pa.

PROPERTY WANTED

A SMALL MACHINE SHOP AND FOUNDRY wanted. One operating fifteen to twenty men. Southern state location preferred. Address Box 916, THE FOUNDRY, Cleveland, O.

WANTED MISCELLANEOUS

HAY ROPE TWISTER WANTED. New or second-hand. Must be in good condition. Address Box 961, THE FOUNDRY, Cleveland, O.

OIL FURNACE WANTED. A No. 3 or No. 4 Rockwell Engineering Co.'s in first-class condition. State price and time in use. Address Box 947, THE FOUNDRY, Cleveland, O.

SECOND-HAND FOUNDRY EQUIPMENT WANTED, including Cupolas, Ladles, Tumbling Barrels, etc. Quote price and state condition. Address Box 885, THE FOUNDRY, Cleveland, O.

SECOND HAND CUPOLA WANTED, 2 to 5 tons, tumbling mill and blower to suit. All must be in good condition. Also, oil tank, about 7,000 gallons.

Morrison & Kretschmer Mfg. Co., Dubuque, Ia.

Books of Interest to Foundrymen

FOUNDRY CHEMISTRY.

BY FRANK L. CROBAUGH.

Price $2.00.

As a practical chemist, making a specialty of analyses for furnaces and foundries, Mr. Crobaugh has come in contact with the questions confronting the founder, when the latter attempts to obtain greater uniformity in his castings through the aid of chemistry. It has been the aim of the author to so prepare his book that it will assist the foundryman in using the information handed him by the chemist.

AMERICAN FOUNDRY PRACTICE.

BY THOS. D. WEST.

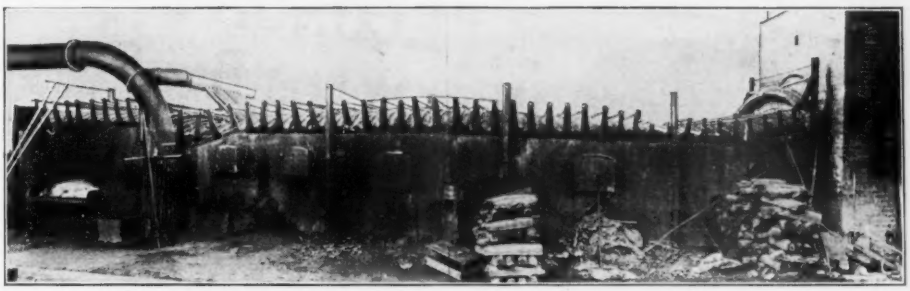
408 pages. Fully Illustrated. Price $2.50.

This is the first book written by Mr. West, and although the first edition appeared twenty years ago it is still considered a standard, constant revision having kept pace with the vast advances made in founding. Green Sand, Dry Sand, and Loam Molding are taken up in turn and methods for producing a casting at the least cost described.

The Foundry

Cleveland.

MODERN
MALLEABLE IRON MELTING FURNACE
OPERATED IN U. S. AND CANADA



See one in operation—it will pay you

Special Features: Strong construction---light bung clamps---swinging side doors---large hearth---proper air distribution---a rapid melter. Also annealing and re-heating furnaces, core ovens, etc.

Quotations of drawings or furnace complete upon application.

Buffalo Furnace Works 229 Carolina St., BUFFALO, N. Y.

The "Everlasting" Triplex Block

A 216 MILE Chain Block Lift

Twenty YALE & TOWNE TRIPLEX BLOCKS have been in use for about 6 years in a rubber works. Each block makes lifts averaging daily 600 ft. This is at the rate of 3 miles per month, 36 miles per year or 216 miles in 6 years. The blocks are still in first-class shape.

Can you use hoists like these?

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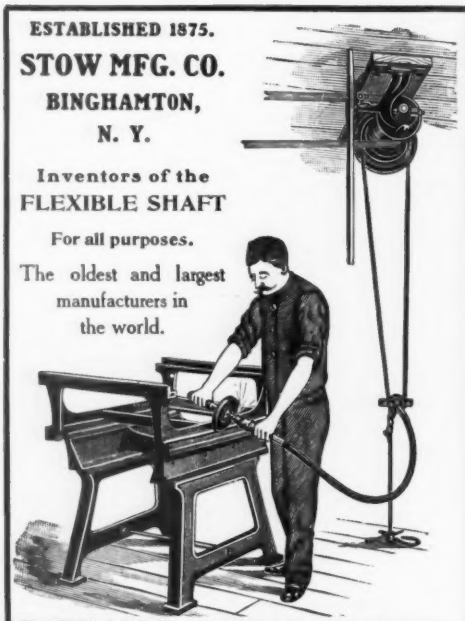

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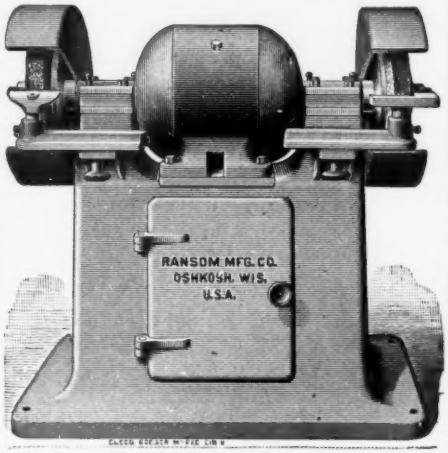

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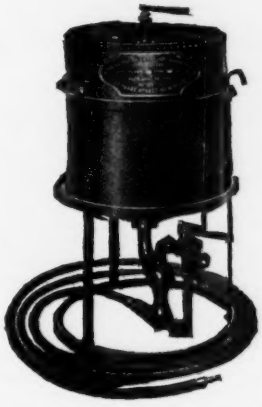

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	Melting										
	Total										
DIRECT CHGS.	Molding Sand										
	Core Sand										
	Brick										
	Accs. Castings										
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	Total										
LABOR	Molding										
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	Direct Labor										
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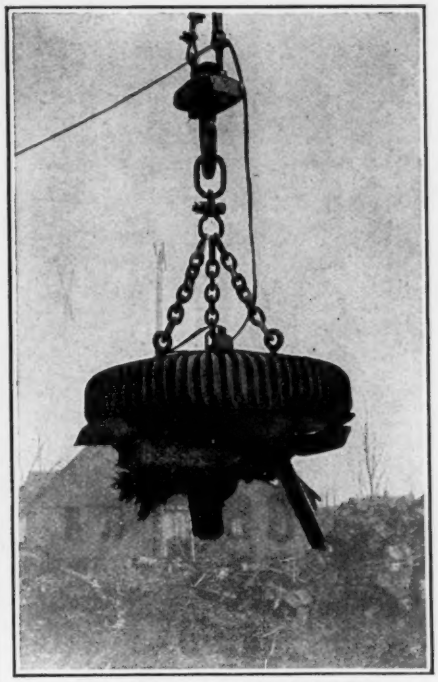

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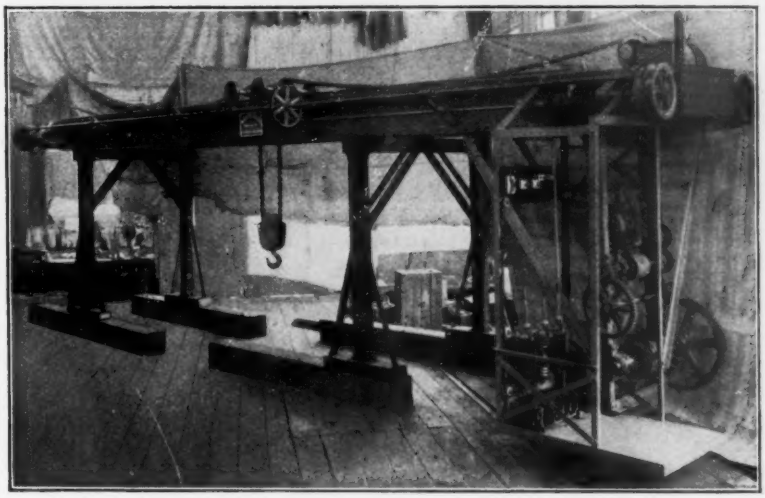

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